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MOJAVE-KERN RIVER-EL DORADO
Natural Gas Pipeline Projects

Final Environmental Impact Report/Statement

VOLUME I

Mojave, El Dorado,
El Paso, and Transwestern

CALIFORNIA STATE LANDS COMMISSION
FEDERAL ENERGY REGULATORY COMMISSION

December 1987

CCI

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VOLUME I

Mojave, El Dorado,
El Paso, and Transwestern

CALIFORNIA STATE LANDS COMMISSION
1807 13th Street
Sacramento, California 95814

and

FEDERAL ENERGY REGULATORY COMMISSION
825 North Capitol Street
Washington, D.C. 20426

CGI
CHAMBERS GROUP, INC.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION
AND
CALIFORNIA STATE LANDS COMMISSION

Mojave Pipeline Company	)	Docket No. CP85-437-003
Kern River Gas Transmission Company	)	Docket No. CP85-552-002
El Dorado Interstate Transmission Company	)	Docket No. CP86-205-001
Northwest Pipeline Corporation	)	Docket No. CP85-625-001
El Paso Pipeline Corporation	)	Docket No. CP86-197-003
Transwestern Pipeline Company	)	Docket No. CP86-212-001

NOTICE OF AVAILABILITY OF THE MOJAVE AND KERN RIVER NATURAL GAS PIPELINE PROJECTS FINAL EIR/EIS

(December 18, 1987)

Notice is hereby given that the Federal Energy Regulatory Commission (FERC) and the California State Lands Commission (SLC) have available a final joint environmental impact report/ statement (EIR/EIS) for the above-listed projects. The EIR/EIS was prepared under the direction of the FERC and SLC staffs to satisfy the requirements of the National Environmental Policy Act and the California Environmental Quality Act. The FERC has determined that approval of any of these projects "would be a major Federal action significantly affecting the quality of the human environment."

The primary projects proposed by Mojave Pipeline Company (Mojave) and Kern River Gas Transmission Company (Kern River), are competing to transport natural gas from various sources outside California to the Bakersfield, California area for use in enhanced oil recovery (EOR) and related cogeneration projects. A previously proposed project, El Dorado Interstate Transmission Company (El Dorado), is examined in the EIR/EIS as an alternative but is not a direct competitor to Mojave or Kern River. On October 27, 1986, FERC Administrative Law Judge Isaac D. Benkin ordered that the El Dorado application be dismissed with prejudice. On October 20, 1987, the Commission adopted the initial decision, dismissed El Dorado's application, and terminated the docket. Also, on June 30, 1987, the SLC denied, without prejudice, El Dorado's application.

In each case, producers of crude oil in the San Joaquin Valley would use the natural gas as boiler fuel to create steam which would then be injected into the oil fields to produce crude oil not recoverable by primary recovery methods. Some of the steam would be used to generate electricity.

The projects proposed by Northwest Pipeline Company (Northwest), El Paso Natural Gas Company (El Paso), and Transwestern Pipeline Company (Transwestern) would deliver natural gas to the primary projects.

The primary projects are competing for the FERC's approval; however, it is unlikely that all projects would be approved. The EIR/EIS treats each primary project with its associated feeder projects as an alternative to the other. Additional alternative systems and routes are also analyzed. The proposed facility requirements for each system are outlined below:

	Mojave 1/	El Dorado	Kern River 2/
Pipeline (miles)	756.2	753.2	837
Compression (horsepower)	22,500	--	35,500

Facilities for the proposed systems would be located in Arizona, California, Nevada, New Mexico, Texas, Utah, and Wyoming. Alternatives would involve the State of Colorado as well. Detailed listings of proposed facilities and affected counties were published in the Federal Register on August 23, 1985, December 13, 1985, and May 19, 1986. (See 50 FR 34174, 50941, and 51 FR 18357.)

The EIR/EIS will be used in the regulatory decisionmaking process at both the FERC and SLC and will be presented as evidentiary matter in formal hearings at the FERC. While the period for filing motions to intervene in these cases has expired, motions to intervene out-of-time can be filed with the FERC in accordance with the requirements of the Commission's Rules of Practice and Procedure, 18 CFR 385.214(d). Further, anyone desiring to file a protest with the FERC should do so in accordance with 18 CFR 385.211.

The EIR/EIS has been placed in the public files of the FERC and SLC and is available for public inspection in the FERC's Division of Public Information, Room 1000, 825 North Capitol Street, N.E., Washington, D.C. 20426 and at the SLC, 1807-13th Street, Sacramento, CA 95814. Copies have been sent to the public, all parties to the proceeding, and Federal, state, and

---

1/ Includes El Paso and Transwestern.

2/ Includes Northwest.

local officials, and are available in limited quantities from the FERC's Division of Public Information and the SLC.

Additional information about the project is available either from Mr. Robert Arvedlund, FERC Project Manager, telephone (202)357-9043, or Ms. Mary Griggs, SLC Project Manager, telephone (916)322-0354.

Claire T. Dedrick
Executive Officer, SLC

Lois Cashell
Acting Secretary, FERC

MOJAVE-KERN RIVER-EL DORADO NATURAL GAS
PIPELINE PROJECTS FINAL EIR/EIS

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ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ADFG	Arizona Department of Fish and Game
AFFTC	Air Force Flight Test Center
AIRFA	American Indian Religious Freedom Act
AUM	Animal Unit Months
BACT	Best Available Control Technology
BLM	Bureau of Land Management
CAA	Clean Air Act
CARB	California Air Resources Board
CDCA	California Desert Conservation Area
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIG	Colorado Interstate Gas Company
CLE	Contingency Level Earthquake
CNPS	California Native Plant Society
CO	Carbon Monoxide
cogen	cogeneration
CUP	Central Utah Project
dBA	Decibels on the A-weighted scale
DOD	Department of Defense
DOT	Department of Transportation
EOR	Enhanced Oil Recovery
EPA	Environmental Protection Agency
ERT	Environmental Research and Technology, Inc.
ESA	Environmental Study Area
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FMIR	Fort Mojave Indian Reservation
FS	Forest Service
g	Gravity
HABS	Historic American Building Survey
hp	Horsepower
IPP	Intermountain Power Project
ISA	Instant Study Area
ISC	Industrial Source Complex
ISZ	Intermountain Seismic Zone
JUMP	Joint Utilities Management Program
KRGT	Kern River Gas Transmission Company
LAER	Lowest Achievable Emission Rate
L_{dn}	day-night sound levels
MAPCO	Mid America Rocky Mountain Liquid Hydrocarbons Pipeline Company
MFR	Mountain Fuel Resources, Inc.
MMcfd	One million cubic feet per day
MOP	Maximum Operating Pressure
MP	Milepost
NA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NAP	Nonattainment Plan
NEPA	National Environmental Policy Act

ABBREVIATIONS (continued)

NGPSA	Natural Gas Pipeline Safety Act
NMDGF	New Mexico Department of Game and Fish
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
Northwest	Northwest Pipeline Company
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRA	National Recreation Area
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NSR	New Source Review
NWR	National Wildlife Refuge
O_3	Ozone
OLE	Operating Level Earthquake
OPC	Overthrust Pipeline Company
PARIS	Plume-Airshed Reactive-Interacting System
PG&E	Pacific Gas and Electric Company
PGT	Pacific Gas Transmission Company
pphm	parts per hundred million
ppm	parts per million
PSD	Prevention of Significant Deterioration
R-E-D	Rarity-Endangered-Distribution
RMPP	Rocky Mountain Pipeline Project
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
SCADA	Supervisory Control and Data Acquisition
SCRA	State of California Resource Agency
SCS	Soil Conservation Service
SEDAB	Southeast Desert Air Basin
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLC	State Lands Commission
SoCal	Southern California Edison Company
StanPac	Standard Pacific Gas Line, Inc.
TSP	Total Suspended Particulates
UDWR	Utah Division of Wildlife Resources
ug/m^3	micrograms per cubic meter
UPA	Unusual Plant Assemblage
UP&L	Utah Power and Light Company
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VAC	Visual Absorption Capacity
VQO	Visual Quality Objective
VRM	Visual Resource Management
WGF	Wyoming Game and Fish
WSA	Wilderness Study Area
Wy-Cal	Wyoming-California Pipeline Company

SUMMARY

S.1 INTRODUCTION

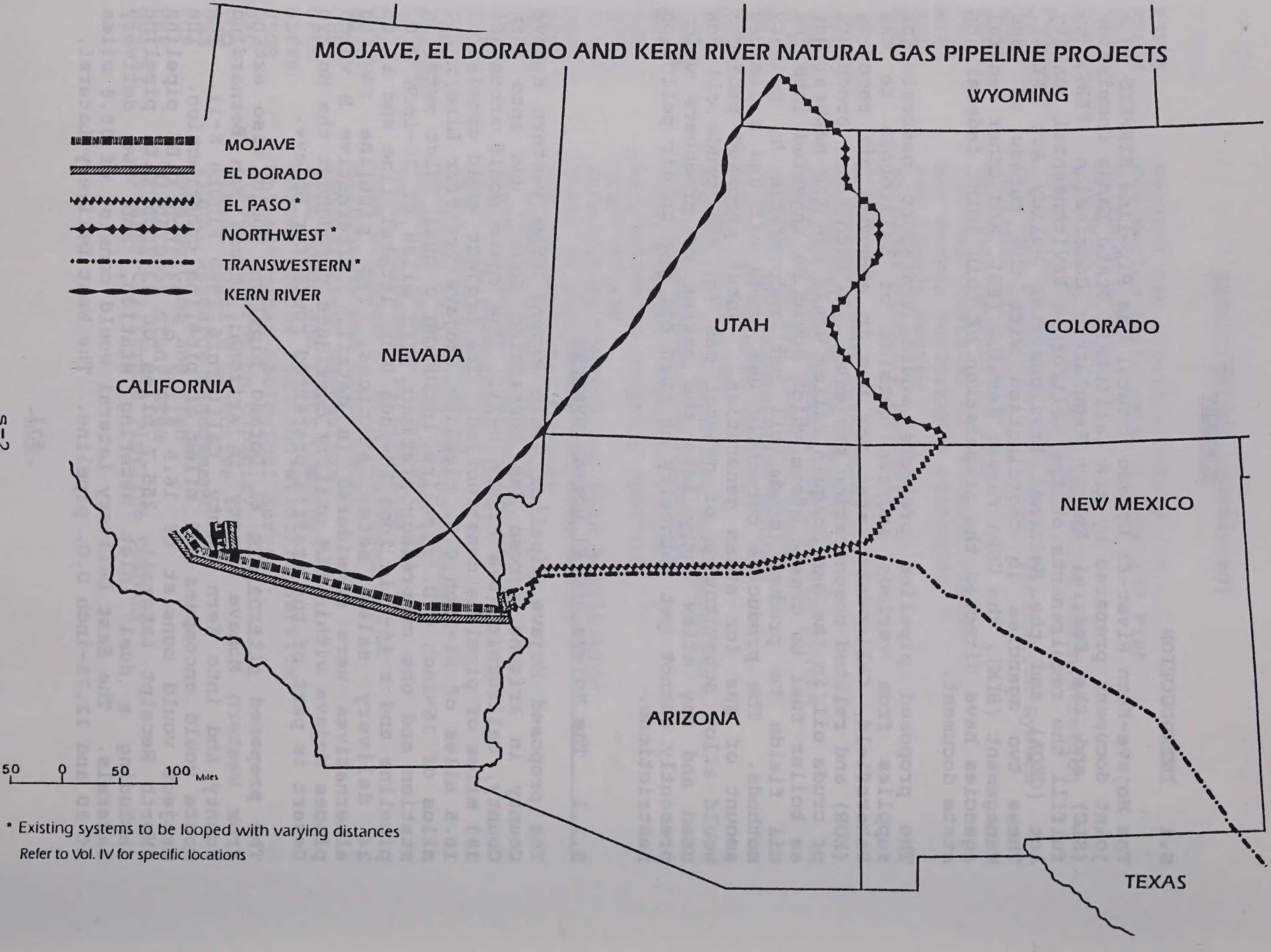
The Mojave-Kern River-El Dorado Natural Gas Pipeline EIR/EIS is a joint document prepared by the California State Lands Commission (SLC) and the Federal Energy Regulatory Commission (FERC) to fulfill the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). These two agencies in coordination with the Bureau of Land Management (BLM), the USDA Forest Service (FS), and other federal agencies have directed the preparation of this joint federal and state document.

The proposed pipeline projects would transport natural gas supplies from various sources outside of California to the Bakersfield, California, area for use in enhanced oil recovery (EOR) and related cogeneration projects. In each case, producers of crude oil in the San Joaquin Valley would use the natural gas as boiler fuel to create steam which would be injected into the oil fields to produce crude oil not recoverable by primary methods. The producers currently use crude oil and a limited amount of gas for steam generation. These proposed projects would allow substitution of natural gas for the crude oil now used and may allow entry into the market of producers which presently cannot get authority to burn oil due to air pollution restrictions.

S.1.1 The Mojave and El Dorado Systems

The proposed Mojave pipeline would extend from western Mohave County in Arizona across San Bernardino County and into Kern County, California (see Figure S-1). The route would encompass 383 miles of pipeline construction. The project would consist of 16.5 miles of 24-inch O.D. pipeline (Mojave Transfer Line); 260 miles of 36-inch O.D. pipeline including a dual inlet metering station and one compressor station; 62.5 miles of 30-inch O.D. pipeline and a 44-mile long 20-inch O.D. lateral line and 17 to 24 delivery sales meter stations. Two pipeline routing alternatives were considered in detail. Alternative B which places Mojave within BLM utility corridors throughout the Mojave Desert is part of the staff's preferred route for Mojave.

The ~~proposed~~ alternative El Dorado pipeline would also extend from western Mohave County in Arizona, across San Bernardino County and into Kern County, California (see Figure S-1). The route would encompass 381 miles of pipeline construction. The project would consist of 16.5 miles of 24-inch O.D. pipeline (North Receipt Lateral), 255.7 miles of 42-inch O.D. pipeline including a dual inlet metering station, and two delivery laterals. The East Delivery Lateral would consist of 35.8 miles of 30 and 12.75-inch O.D. pipeline. The West Delivery Lateral,


MOJAVE, EL DORADO AND KERN RIVER NATURAL GAS PIPELINE PROJECTS
MOJAVE
EL DORADO
EL PASO *
NORTHWEST *
TRANSWESTERN *
KERN RIVER
WYOMING
UTAH
COLORADO
NEVADA
CALIFORNIA
NEW MEXICO
ARIZONA
TEXAS
50
0
50
100
Miles

* Existing systems to be looped with varying distances
Refer to Vol. IV for specific locations

Figure S-1

including a spur to Maricopa, California, would consist of 72.5 miles of 30-, 24-,and 8.625-inch O.D. pipeline. Three pipeline routing alternatives to the El Dorado ~~proposal~~ route were considered in detail. The staff did not believe any alternatives held significant advantages over the ~~proposed~~ primary route.

Both the Mojave and El Dorado pipelines would receive gas supplies from El Paso Natural Gas Company (El Paso) and/or Transwestern Pipeline Company (Transwestern) in Mohave County, Arizona. El Paso proposes to loop two segments of its existing line in Apache and Navajo Counties, Arizona. The proposed case would involve 14.8 miles of 30-inch O.D. pipe and would deliver 400 MMcfd of gas to either the Mojave or El Dorado pipeline. A second alternative scenario (the 100/500 Case) would involve 211.9 miles of 24-, 30-, and 34-inch O.D. pipe to deliver 600 MMcfd to either the Mojave or El Dorado pipelines. An additional 8880 hp of compression would also be installed at existing stations for the 600 MMcfd scenario. The 600 MMcfd alternative would eliminate the need for the Transwestern proposal.

Although not required in El Paso's proposed case, the 600 MMcfd scenario assumes that up to 200 MMcfd of the total volume would be supplied by Northwest Pipeline Corporation (Northwest) at the Ignacio, Colorado, receipt point. Northwest has stated that for the 200 case, 162 miles of 24-inch loop pipeline at seven intervals would be required south of the Muddy Creek Compressor Station at Opal, Wyoming, to Ignacio, Colorado, with an additional 32,000 hp of compression at three separate sites. It should be noted that up to 100 MMcfd could be provided with only 8.1 miles of looping and 19,000 hp at the same locations.

Transwestern proposes to loop 11 segments of its existing lines between Pyote, Texas, and Needles, California. Approximately 356 miles of looping with 30-inch O.D. pipe would be completed in order to tie into either the Mojave Transfer Line or the El Dorado North Receipt Lateral. This expansion would allow Transwestern to deliver 320 MMcfd to either the Mojave or El Dorado pipelines.

S.1.2 The Kern River System

The proposed Kern River pipeline would begin at Northwest's Muddy Creek Station near Opal, Wyoming, and would run south-southwest across Utah and Nevada, and west across the Mojave Desert in both San Bernardino and Kern Counties in California (see Figure S-1). The project would consist of 756 miles of 36-inch O.D. mainline and 75 miles of 30-inch O.D. lateral pipeline to deliver 700 MMcfd of natural gas. This gas would come from major existing sources in the Overthrust Belt gas fields in southwest Wyoming and northeast Utah, and western Canadian gas fields. Three compressor stations providing a total of 35,500 hp would be constructed as part of the project.

In connection with the Kern River proposal, six pipeline routing variations were considered in detail. Of these, two have been adopted by staff. The Wasatch Variation avoids crossing approximately 100 miles of rugged mountainous terrain which would be traversed by the proposed route. It also avoids crossing the Uinta National Forest. The variation diverges from the proposed route at approximately MP 73 and rejoins it at MP 204. Use of the Wasatch Variation would add approximately 23 miles to the overall length of the route and would require relocation and increase horsepower for two of the proposed compressor stations. These increases would total 800 hp.

The second variation recommended by staff, the North Las Vegas Variation, was developed as an alternative to crossing Rainbow Gardens ~~Natural--Area~~, Las Vegas Wash, the Sunrise Mountain ~~Instant-Study-Area~~ Natural Area and the southern Las Vegas Valley in general. The variation would begin at MP 438 and would rejoin the proposed route at MP 534. This variation utilizing the Goodsprings Spur would require 109 miles of pipeline compared to the 96 miles for the corresponding segment of the proposed route. Utilization of the North Las Vegas variation would require relocation of a compressor station but no changes in compression would be necessary.

S.1.3 The "No Action" Alternative

The "No Action" alternative has two general scenarios. The first is the Status Quo scenario which assumes that no additional natural gas would be supplied to the EOR users. Theoretically this scenario could result from denial of the interstate projects, refusal of the CPUC to allow additional intrastate service, and a choice by the producers not to receive more gas under the CPUC's regulation. While this scenario may be possible, it would appear extremely unlikely to occur because of the necessary combination of the above conditions and market forces.

The second scenario involves denial of the interstate proposals, followed by increased supply of gas via the intrastate gas companies. This scenario was developed in detail. Four intrastate system alternatives were developed to supply natural gas to the EOR market. The main advantage to the intrastate system alternatives concern the utilization of existing natural gas transmission facilities within the State of California, and for the most part, in other states as well.

The Integrated Intrastate System Alternative to Mojave and El Dorado would use spare capacity on both the Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal) systems to deliver at least 600 MMcfd from the California/Arizona border to the EOR market. If these systems are operated in an integrated fashion, the only additional facility requirement would be the Mojave Transfer Line. Under this alternative, El Paso and/or Transwestern would supply the 600 MMcfd to the integrated intrastate system through their existing facilities.

The East Las Vegas System Alternative was suggested by the FERC staff as a possible means of reducing pipeline mileage associated with Kern River's proposed route between Las Vegas, Nevada, and Bakersfield, California. This alternative would also utilize the Wasatch Variation, replacing portions of the proposed Kern River route through the Wasatch Mountains and across the Uinta National Forest as was discussed for the interstate system. The alternative would follow a route similar to one originally identified as part of the Rocky Mountain Pipeline Project between a point on Kern River's proposed route at MP 491 and a termination point south of Camino, California, on the PG&E line. The final 15 miles of this alternative would intersect major intrastate transmission facilities of PG&E and SoCal.

The East Las Vegas system would then transport the gas 250 miles westward to the Bakersfield area. The only facility requirement on the intrastate system would be turbocharging of existing compressors at the Hinkley compressor station west of Barstow, California.

Use of the East Las Vegas System Alternative would substitute 105 miles of pipeline construction between Las Vegas and the Camino, California, area for 265 miles proposed by Kern River between Las Vegas and Bakersfield.

The Northwest/PGT/Integrated Intrastate System Alternative was developed by the FERC staff to explore the feasibility of providing the EOR/cogeneration industry with direct access, by way of existing transmission systems, to major sources of natural gas in western Canada and the southwest/southcentral United States without construction of a major new system as proposed by Kern River. The alternative would use two major gas transmission corridors linking production regions with the Bakersfield area. One corridor would extend south from Canada through Idaho, Washington, Oregon and California along inter- and intrastate pipelines owned by Northwest, Pacific Gas Transmission Company (PGT) and PG&E. The other corridor extends between west Texas and southern California on pipeline systems owned by Transwestern or El Paso which interconnect with PG&E and SoCal at the California border. For analysis, this alternative assumes that Kern River's proposed throughput would be divided equally with half coming from each production area. No new facilities would be required.

S.1.4 Alternatives Eliminated

Alternatives considered but eliminated from detailed analyses included a number of system and routing alternatives. The alternatives were eliminated from detailed analyses because of economic, feasibility, and/or environmental constraints.

S.2 AREAS OF CONCERN

Areas of concern involve impacts resulting from construction and operation of the pipelines at several locations along the proposed routes. The proposed Mojave route raises land use concerns in the Mojave Desert related to the non-utilization of established BLM utility corridors and crossing 17 miles of Edwards Air Force Base. Environmental concerns include construction activities through sensitive areas, including habitat of the desert tortoise, Mojave ground squirrel, the blunt-nosed leopard lizard, the San Joaquin kit fox, and critical habitat of the California condor.

The El Dorado route would have the same areas of environmental concern as those discussed above, but it would involve less divergence from the BLM utility corridors.

Areas of controversy associated with the proposed Kern River route include geologic and soils concerns within the Uinta National Forest in Utah. The USDA Forest Service is also concerned with conformance to National Forest Land and Resource Management Plans which provide for designated utility corridors across National Forest System lands. The Kern River proposal and portions of the Wasatch Variation would lie outside of designated corridors; and, therefore, may not meet the management standards and guidelines for sensitive soil, watershed, recreation, wildlife, and visual resources values. Other areas of concern associated with the proposed Kern River route include construction across the Sunrise Mountain ~~Instant-Study~~ Natural Area, Rainbow Gardens ~~Natural-Area~~, and Las Vegas Wash area near Las Vegas, Nevada. Construction of the route through the sensitive areas discussed above for Mojave and El Dorado would also be present along the proposed Kern River route through California.

The major concern regarding any alternative involving intrastate systems relates to their ability to provide a firm supply of gas to the Bakersfield area, one of the stated goals of the project.

S.3 MAJOR IMPACT CONCLUSIONS

Significant impacts have been analyzed in detail in Section 4 of both volumes of this final EIR/EIS, and mitigation measures have been developed. Table S-1 presents data relevant to impacts that would result from implementation of staff's preferred routing of the three proposals. Tables S-2 through S-7 include the planned and additional mitigation measures presented in Section 4 for all of the significant impacts. These summary tables also indicate whether the impact would still be significant after implementation of the mitigation measures.

Table S-1

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C 1/ with Alternative B	Proposed El Dorado System A	Preferable El Dorado 2/ System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations
AIR QUALITY	NSI 3/	NSI	NSI	NSI	NSI	NSI
GEOLOGY						
Surface fault rupture	18	16	18	16	23	23
Miles of landslide potential	27	43	27	43	163	130
Miles of slope greater than 30%	69	45	82	57	229	215
SOIL						
Acres of poor reclamation potential	4768	3483	4343	3052	4882	4324
SURFACE WATER						
Number of stream crossings	74	68	68	61	135	147
Intermittent stream crossings	71	65	65	58	83	109
Perennial stream crossings	3	3	3	3	52	39
Moderate/high significance perennial stream crossings	0	0	0	0	39	27
GROUNDWATER						
Miles of potential impact	30	17	15	7	10	6
FRESHWATER BIOLOGY						
Number of sensitive stream crossings with fish present	0	0	0	0	13	7
TERRESTRIAL BIOLOGY						
Vegetation						
Total acres of native vegetation temporarily disturbed	8465	6561	8549	6697	8646	8221

Table S-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C 1/ with Alternative B	Proposed El Dorado System A	Preferable El Dorado 2/ System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations
Vegetation (continued)						
Acres of woody vegetation kept cleared for the life of the project	1765	1774	1838	1797	2920	2719
Acres of riparian habitat crossed	61	60	24	24	98	148
Acres of federally threatened or endangered plant habitat affected	60	0	60	0	0	0
Number of species	1	0	1	0	0	0
Acres of California classified plant habitat affected	947	947	947	947	536	536
Number of species	3	3	3	3	4	4
Acres of agricultural land temporarily disturbed	767	731	525	489	1561	1846
Wildlife						
Big game crucial or high priority habitat (acres)	748	564	748	564	1350	1155
Big game migration corridors (acres)	121	121	121	121	162	48
Big game fawning/ calving areas (acres)	56	0	56	0	0	0
Upland game bird sensitive habitat (acres)	0	24	0	24	404	428
Critical waterfowl nesting areas (acres)	0	0	0	0	60	46
Raptor nesting areas (nests)	0	0	0	0	12	15
Acres of potential threatened or endangered animal habitat affected	9615	9467	8819	8799	8404	8421

Table S-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C 1/ with Alternative B	Proposed El Dorado System A	Preferable El Dorado 2/ System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations
Wildlife (continued)						
Yuma clapper rail	151	36	97	36	0	0
Bald eagle	187	72	169	115	121	168
Peregrine falcon	490	60	490	121	0	0
Whooping crane	0	0	0	0	0	0
California condor	1355	1355	1492	1492	1560	1560
Blunt nosed leopard lizard	517	517	388	388	339	339
Tehachapi slender salamander	18	18	0	0	3	3
Desert tortoise	3032	3274	2756	2998	3716	3686
San Joaquin kit fox	647	647	410	410	333	533
Black-footed ferret	1345	1567	1345	1567	600	600
Utah prairie dog	0	0	0	0	0	0
Mohave ground squirrel	727	775	667	667	751	751
Nelson's antelope squirrel	412	412	412	412	290	290
Tipton kangaroo rat	24	24	24	24	24	24
Short-nosed kangaroo rat	410	410	436	436	290	290
Giant kangaroo rat	300	300	133	133	177	177
SOCIOECONOMICS						
Population change >10%	No	No	No	No	No	No
Total employment change >10%	No	No	No	No	No	No

Table S-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C [1] with Alternative B	Proposed El Dorado System A	Preferable El Dorado System C [2]	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations
SOCIOECONOMICS						
Income change >10%	No	No	No	No	No	No
Vacancy rates of temporary housing <5%	Yes	Yes	Yes	Yes	Yes	Yes
Local tax base change >10%	1 county	1 county	1 county	1 county	7 counties	7 counties
Traffic	NSI	NSI	NSI	NSI	NSI	NSI
Operational Noise	NSI	NSI	NSI	NSI	NSI	NSI
Recreation (conflicts)	5	5	2	2	6	4
LAND USE/OWNERSHIP conflicts	9	5	6	3	5	2
CULTURAL RESOURCES						
Number of sites in the direct impact zone	82	88	86	95	77	81
NRHP listed or eligible sites in the direct impact zone	2	2	2	2	4	4
Percentage of line actually surveyed or survey coverage within analysis corridor	6	12	12	15	5	6
High sensitivity segments	8	9	9	9	9	10
PALEONTOLOGY						
Acres of impact to significant formations	3205	2571	2935	2454	6119	7240
VISUAL RESOURCES						
Acres of high visual impact	0	0	318	318	524	290

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[1] Mojave System C = Mojave/El Paso (100/500)/Northwest (100)

[2] Alternative B keeps Mojave within the desert corridor near Barstow, California
El Dorado System C = El Dorado/El Paso (100/500)/Northwest (100)

[3] NSI = No Significant Impacts

Table S-2

SIGNIFICANT ADVERSE IMPACTS FOR THE MOJAVE PROPOSAL

Discipline	Significant Impact	Mitigation [1] Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Slope stability in the Tehachapi Mountains potential landslides	5, 6, 11, and 13	Implementation of appropriate controls would resolve significant impacts	No
	Subsidence: hydrocompaction potential is significant between MP 290-312 and 260-270	10, 14	Reduce potential to cause hydrocompaction to minimal levels	No
	Potential ground rupture at fault crossings including Garlock, White Wolf, and Edison	5, 6, and 13	Ground motion parameters developed will be used in seismic design of the pipeline and ancillary structures	No
SOILS Construction and operation	Probability of significant wind erosion is high on the Mojave Transfer Line and on the Main line between MP 0-128.5, 166-176	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, and 38	Probability of successful revegetion will be improved on affected soils	Yes
	Probability for significant water erosion is high on mainline between MP 153-154, 228-256, 312-316	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	Water erosion potential will be decreased and probability of successful revegetation will be improved	Yes
SURFACE WATER Construction and operation	Probability of significant intensive surface runoff increasing sediment load and decreasing water quality in the Tehachapi Mountains, Kern River, and Poso Creek	39, 40, 42, 43, 44, 45, 50, 51, 52, 57, and 58	Reclamation potential of some soils on steep slopes may be so poor that stabilization may take 5 to 10 years	No
	Possibility of significant impact caused by hydrostatic test water withdrawal and discharge	48, 49, 53, 54, 55, and 56	Minimize scouring and reduce increased sedimentation to streams, minimize downstream impact on water availability	No
GROUNDWATER Construction and operation	Possibility of significant impacts to ground water caused by contamination due to fuel or chemical spills around MP 200	56 and 59	Reduce potential for spills and avoid shallow ground water areas	No
	Possible adverse impact on springs	60	Damage to important springs due to and grading would be minimized	No
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed banks stream banks	No

Table S-2 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE MOJAVE PROPOSAL

Discipline	Mitigation [1] Significant Impact	Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur primarily along the northern end of the Kern River Lateral	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce magnitude of impacts	No
	Loss of oak-pine woodland habitat would occur in the Tehachapi Mountains. Loss of plant species of special concern.	67, 68, 71, 73, 82, 84, and 85	Realignment of the proposed route to avoid populations or habitats of plant species would be most effective method of reducing impacts	No
	Loss of wildlife species of special concern including threatened or endangered species and associated habitats	86, 90, 91, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, and 115	Reduce stress on animals and destruction of habitat associated with use of ORV's, identification of construction periods to coincidence with wildlife requirements would reduce stress, habitat identification could be possible mitigation to reduce impacts	Yes
	Loss of individual desert tortoise and their habitat	89, 96, 97, 110, 111, and 113	Reduce impacts to individuals and habitats	No
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflicts	130, 145, 146, and 147	Reduce impacts to individuals and and reduce land use/ownership conflicts	Yes
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed	133 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds and reduction of significant fossiliferous formations. This would result in a permanent loss of the resource.	139	Reduce impacts by monitoring would allow some knowledge on the formation which would allow assessment of the formation for future research	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of established VRM class could occur	140, 141, and 142	Reduce impacts to the visual environment to acceptable levels by following contours, revegetating, etc.	No

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[1] Numbers refer to mitigation measures listed in Section 4 of Volume I.

Table S-3

SIGNIFICANT ADVERSE IMPACTS FOR THE EL DORADO ALTERNATIVE

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Slope stability in the Tehachapi Mountains, potential landslides	7, 8, 9, 13, 14, and 12	Implementation of appropriate controls would resolve significant impacts	No
	Subsidence: hydrocompaction potential is significant between MP 290-310 and 256-268	13 and 14	Reduce potential to cause hydrocompaction to minimal levels	No
	Potential ground rupture at fault crossings including Garlock, White Wolf, and Edison	13	Ground motion parameters developed will be used in seismic design of the pipeline and ancillary structures	No
SOILS Construction and operation	Probability of significant wind erosion is high on the North Receipt Lateral and on the Main line between MPO-180	16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, and 38	Probability of successful revegetion will be improved on affected soils	Yes
	Probability for significant water erosion is high on mainline between MP 146-147, 240-254, 305-310	16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	Water erosion potential will be decreased and probability of successful revegetation will be improved	Yes
SURFACE WATER Construction and operation	Probability of significant intensive surface runoff increasing sediment load and decreasing water quality in the Tehachapi Mountains, Kern River, and Poso Creek	41, 42, 43, 50, 51, 52, 57, and 58	Reclamation potential of some soils on steep slopes may be so poor that stabilization may take 5 to 10 years	No
	Possibility of significant impact caused by hydrostatic test water withdrawal and discharge	48, 49, 53, 54, 55, and 56	Minimize scouring and reduce increased sedimentation to streams, minimize downstream impact on water availability	No
GROUNDWATER Construction and operation	Possibility of significant impacts to ground water caused by contamination due to fuel or chemical spills	56 and 59	Reduce potential for spills and avoid shallow ground water areas	No
	Possible adverse impact on springs	60	Damage to important springs due blasting and grading would be minimized	No
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	61, 62, 63, 64, and 65	Reduce instream disturbance and restore disturbed stream banks	No

Table S-3 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE EL DORADO ALTERNATIVE

Discipline	Significant Impact	Mitigation [1] Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur primarily along the northern end of the East Delivery Lateral	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce magnitude of impacts	No
	Loss of oak-pine woodland habitat would occur in the Tehachapi Mountains. Loss of plant species of special concern.	67, 68, 71, 73, 82, 84, and 85	Realignment of the proposed route to avoid populations or habitats of plant species would be most effective method of reducing impacts	No
	Loss of wildlife species of special concern including threatened or endangered species and associated habitats	86, 91, 92, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, and 115	Reduce stress on animals and destruction of habitat associated with use of ORV's, identification of construction periods to coincidence with wildlife requirements would reduce stress, habitat identification could be possible mitigation to reduce impacts	Yes
	Loss of individual desert tortoise and their habitat	92, 96, 97, 110, 111, and 113	Reduce impacts to individuals and habitats	No
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflicts	130 and 153	Reduce impacts to individuals and reduce land use/ownership conflicts	Yes
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed	134 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds and reduction of significant fossiliferous formations. This would result in a permanent loss of the resource.	139	Reduce impacts by monitoring. Would allow some knowledge on the formation which would allow assessment of the formation for future research	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of established VRM class could occur	140, 141, and 142	Reduce impacts to the visual environment to acceptable levels by following contours, revegetating, etc.	No

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[1] Numbers refer to mitigation measures listed in Section 4 of Volume I.

Table S-4

SIGNIFICANT ADVERSE IMPACTS FOR THE EL PASO PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY				
Construction and operation	Possibility of significant slope instability along the Window Rock, Leupp and Williams Loops (Base Case and Alternatives)	13 and 14	Implementation of appropriate controls would resolve significant impact	No
SOILS				
Construction and operation	Reclamation potential would be poor on nearly one-half of total construction mileage (Base Case and Alternatives)	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would substantially increase	Yes
TERRESTRIAL BIOLOGY				
Construction and operation	Loss of approximately 0.8 acres of wetland and riparian vegetation would occur along portions of the loops (Alternatives)	67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts	No
	Loss of individuals and habitat of plant species of special concern would potentially occur along 7 of the loops (Base Case and Alternatives)	67, 68, 69, 70, 71, 84, and 85	Realignment would effectively reduce impacts by avoiding populations of sensitive species and their habitats	No
	Impacts of the Ferruginous and Swainson's hawk, Mountain plover, desert tortoise and gila monster (all species of special concern) and their habitat could potentially occur along a number of loops Ferruginous and Swainson's hawk, and Mountain Plover (Base Case and Alternative); Desert Tortoise and Gila monster (Alternatives only)	86, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, and 115	Reduction of stress on sensitive species during critical time periods would minimize overall impacts on the population, as would restricting access	No
LAND USE/OWNERSHIP				
Construction and operation	Land use/ownership conflict (Alternative)	129, 130, 131, 132, and 157	Eliminate crossing the Elden Environmental Study Area	No

Table S-4 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE EL PASO PROPOSAL

Discipline	Mitigation [1] Significant Impact	Measures	Effectiveness	Residual Significant Impact
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed (Base Case and Alternatives)	135 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials Base Case and Alternative)	138 and 158	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds, localities or formations could result in a permanent loss of the resource (Base Case and Alternative)	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES Construction and operation	Loss of significant visual visual environment and degradation of VRM or VQO class could occur (Alternatives)	140, 141, and 142	Reduction of visual impacts to acceptable level is possible	No

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[1] Numbers refer to mitigation measures listed in Section 4 of Volume I.

Table S-5

SIGNIFICANT ADVERSE IMPACTS FOR THE NORTHWEST EXPANSION PROJECT

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Rangely A & B Loops are in areas with significant slope stability problems	13 and 14	Inplementation of appropriate controls could resolve significant impact	No
	Rangely A & B Loops are in areas with significant potential to be impacted by flooding and debris flows	14	Reduce damage potential from flooding and debris flows	No
SOILS Construction and operation	The potential for significant water erosion is high on some portions of the Cisco Loop. Reclamation potential would be poor on the Muddy Creek, Cisco and Moab Loops	16, 18, 19, 21, 24, 25, 26, 27, 28, 28, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would be considerably increased	Yes
SURFACE WATER Construction and operation	High potential for increase in sediment loading to Douglas Creek along Rangely Loop A and to East Salt Creek along Rangely Loop B	42, 43, 50, 51, 52, 57, and 58	Measures would reduce the amounts of sediment available for entry into the streams and restrict its transport	No
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed stream beds	No
TERRESTRIAL BIOLOGY Construction and operation	Loss of over 5 acres of wetland and riparian vegetation would occur along portions of the Muddy Creek, Rangely A, Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts.	No
	Potential loss of plant species of special concern (threatened or endangered) could occur along portions of the Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 84, 85, and 160	Impacts would be reduced if sensitive species or habitats could be avoided. Limiting access would minimize additional disturbance.	No
	Loss of wildlife species of special concern and associated habitats could occur along all the loops	86, 96, 97, 98, 99 100, 101, 103, 104, 105, 106, 107, 109, 111, 112, 113, 114, and 115	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No

Table S-5

SIGNIFICANT ADVERSE IMPACTS FOR THE NORTHWEST EXPANSION PROJECT

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY				
Construction and operation	Rangely A & B Loops are in areas with significant slope stability problems	13 and 14	Inplementation of appropriate controls could resolve significant impact	No
	Rangely A & B Loops are in areas with significant potential to be impacted by flooding and debris flows	14	Reduce damage potential from flooding and debris flows	No
SOILS				
Construction and operation	The potential for significant water erosion is high on some portions of the Cisco Loop. Reclamation potential would be poor on the Muddy Creek, Cisco and Moab Loops	16, 18, 19, 21, 24, 25, 26, 27, 28, 28, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would be considerably increased	Yes
SURFACE WATER				
Construction and operation	High potential for increase in sediment loading to Douglas Creek along Rangely Loop A and to East Salt Creek along Rangely Loop B	42, 43, 50, 51, 52, 57, and 58	Measures would reduce the amounts of sediment available for entry into the streams and restrict its transport	No
FRESHWATER BIOLOGY				
Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed stream beds	No
TERRESTRIAL BIOLOGY				
Construction and operation	Loss of over 5 acres of wetland and riparian vegetation would occur along portions of the Muddy Creek, Rangely A, Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts.	No
	Potential loss of plant species of special concern (threatened or endangered) could occur along portions of the Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 84, 85, and 160	Impacts would be reduced if sensitive species or habitats could be avoided. Limiting access would minimize additional disturbance.	No
	Loss of wildlife species of special concern and associated habitats could occur along all the loops	86, 96, 97, 98, 99 100, 101, 103, 104, 105, 106, 107, 109, 111, 112, 113, 114, and 115	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No

Table S-5 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE NORTHWEST EXPANSION PROJECT

Discipline	Mitigation 1/ Significant Impact	Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY (continued)				
	Disturbance of golden eagle, prairie falcon and burrowing owl nesting sites along the loops could be significant	86, 98, 99, 103, 104, 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of an active sage grouse lek along the Muddy Creek Loop is significant	96, 99, 100, 101, 103, 104 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of pronghorn or critical winter range is significant along the Muddy Creek Loop	96, 99, 100, 101, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Potential for black-footed ferret along the Muddy Creek, Green River, Cisco, Moab and Cahone Loops exists	99, 100, 101, 103, 104, 105, 112, 113, 114, 161, and 162	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of an active peregrine falcon aeyrie near the Moab Loop would be significant	86, 98, 99, 103, 104, 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
LAND USE	Significant impacts to existing ROW users could occur along Rangely Loop A	129, 130, 131, and 132	Consultation with appropriate ROW users should resolve any conflicts	No
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and research potential which could be permanently destroyed	137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials	138	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds, localities or formations could result in a permanent loss of the resource	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of VRM or VQO class could occur	140, 141, and 142	Reduction of visual impacts to acceptable levels is possible	No

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1/ Numbers refer to mitigation measures listed in Section 4 of Volume I.

Table S-6

SIGNIFICANT ADVERSE IMPACTS FOR THE TRANSWESTERN EXPANSION PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Potential of significant slope instability along portions of some of the loops	6, 7, 13, and 14	Implementation of appropriate controls would resolve significant impact	No
	Probability of significant impacts caused by subsidence along Loops A and E	10 and 14	Reduce hydrocompaction potential to minimal levels	No
	Potential ground rupture at fault crossing in western Rio Grande Rift Valley	5, 6, and 13	Ground motion parameter would be developed and used in seismic design of the pipeline	No
SOILS Construction and operation	Reclamation potential would be poor on one-half of total construction mileage	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would be substantially increased	Yes
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed stream beds	No
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur along portions of some of the loops	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts	No
	Loss of sensitive plant species habitat could occur along portions of the loops	67, 68, 71, 84, and 85	Successful implementation would would effectively reduce impacts by avoiding populations of sensitive species	No
	Loss of endangered and threatened wildlife species and habitat could occur on portions of some of the loops	86, 87, 93, 94, 95, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, 115, 167, 168, and 169	Reduction of stress on sensitive species during critical time periods would minimize overall impacts on the population, as would restricting access	No

Table S-6 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE TRANSWESTERN EXPANSION PROPOSAL

Discipline	Significant Impact	Mitigation [1] Measures	Effectiveness	Residual Significant Impact
LAND USE/OWNERSHIP				
Construction and operation	Land use/ownerhip conflict	129, 130, 131, 132, 170, 171, and 172	Would eliminate all conflicts	No
CULTURAL RESOURCES				
Construction and operation	Potential loss of significant cultural resource data could occur causing a loss of scientific knowledge	136 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials	138 and 173	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES				
Construction and operation	Potential loss of significant fossil finds, localities or formations would result in a permanent loss of the resource	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES				
Construction and operation	Loss of visual environment and degradation of VRM or VQO class could occur	140, 141, and 142	Reduction of visual impacts to acceptable level is possible	No

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[1] Numbers refer to mitigation measures listed in Section 4 of Volume I.

Table S-7

SIGNIFICANT ADVERSE IMPACTS FOR THE KERN RIVER PROPOSAL

Discipline	Significant Impact	Mitigation [1] Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Significant impact caused by slope instability and avalanche could occur in Wasatch Mountain portion of mainline and the Tehachapi Mountains	5, 6, 8, 10, 11, 12, 14, 15, and 16	Implementation of appropriate controls would minimize significant impact	Yes
	Significant impact caused by hydrocompaction could occur in the Mettler area and within the San Joaquin Valley	7	Reduce hydrocompaction potential to minimal levels	No
	Potential ground rupture at fault crossings including Wasatch, Garlock and White Wolf	5, 6, 10, 11, and 13	Ground motion parameters will be developed and used in seismic design of the pipeline and ancillary facilities	No
SOILS Construction and operation	Significant water erosion of soils could occur along portions of the route between Wyoming and California. Highest potential would occur in areas traversing mountains or steep hills	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 39, 40, 41, 42, 43, 44, and 45	Water erosion potential will be decreased and probability for successful revegetation will be improved	Yes
	Significant wind erosion of to soils could occur along all portions of the route particularly in the Mojave Desert	18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 31, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, and 45	Probability for successful reclamation will be increased	Yes
SURFACE WATER Construction and operation	Significant impacts caused by hydrostatic test water discharge could occur	54, 55, 56, 57, 66, 67, 68, and 69	Scouring would be minimized at discharge site. Sedimentation to streams would be decreased	No
	Significant impacts caused by increased sediment loading could occur particularly in steep terrain in the Wasatch and Tehachapi Mountains	46, 47, 48, 49, 50, 51, 52, 53, 58, 59, 60, 61, 62, 63, 64, and 65	Impacts could be reduced, but steep slopes would remain as severe reclamation problem areas and some sedimentation would still occur	Yes
GROUND WATER Construction and operation	Possibility of significant impacts to groundwater caused by contamination due to fuel or chemical spills in shallow groundwater areas	70	Reduce potential for spills and avoid shallow groundwater areas	No
	Possible adverse impact on springs	71	Damage to important springs due to blasting and grading would be minimized	

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[1] Numbers refer to mitigation measures listed in Section 4 of Volume II.

Table S-7 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE KERN RIVER PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
FRESH WATER BIOLOGY Construction and operation	Potential significant impacts could occur from construction activities at 13 stream crossings in the Middle Rocky Mountains region, particularly the Provo River and Beaver Creek which cross habitats of sensitive species	72, 73, 74, and 75 in addition to measures outlined for surface water	Impacts could be reduced, but steep slopes would remain as severe reclamation problem areas and some sedimentation would still occur	Yes
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian zone vegetation would occur along portions of the entire route particularly the Strawberry, Bear and Weber Rivers in Utah and Las Vegas Wash in Nevada	74, 76, 78, 79, 82, 85, 86, and 87	Successful reclamation would greatly reduce the magnitude of impacts.	No
	Loss of plant species of special concern and habitat could occur along the entire route, particularly in the Basin and Range, Mojave Desert, and San Joaquin Valley Regions	77, 78, 79, 83, 84, 86, and 87	Realignment to avoid problem areas in the only way to effectively minimize impacts. Restricted access would enhance the probability of successful reclamation	No
	Loss of wildlife species of special concern could occur along portions of the entire route particularly affecting species in the Wyoming Basin, the Mojave Desert, and the San Joaquin Valley	88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, and 115	Reduction of stress and impacts during critical time periods would minimize overall effects on the populations. Immediate revegetation replaces lost habitat with less impact on species. Field surveys define areas to avoid and/or regulate timing of activities.	Yes
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflicts	15, 129, 130, 131, 132, and 133	Reduce land use/ownership conflicts	Yes
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed	134, 135, and 136	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds and reduction of significant fossiliferous formations. Result in a permanent loss of the resource.	137	Reduce impacts by monitoring would allow some knowledge on the formation which would allow assessment of the formation for future research	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of established VRM or VQO class could occur.	138, 139, and 140	Reduce impacts to the visual environment to acceptable levels by following contours, revegetating, etc.	Yes

S.4 ENVIRONMENTAL STAFF CONCLUSIONS

Because the Integrated Intrastate System Alternative and the Northwest/PGT/Integrated Intrastate System Alternative involve minimal or no construction of new facilities, they would be far superior to any of the interstate systems discussed above. However, use of intrastate systems may not meet one of the main goals of the project, i.e., supplying a firm supply of gas to the EOR market. Resolution of this issue is beyond the scope of the EIR/EIS, but will be given full consideration in the certification process before the FERC.

If use of the intrastate systems is determined to be unacceptable and there is a project need, one of the projects would be constructed. Information provided by the applicants and further developed by the environmental staff indicates that construction and operation of any of the proposed interstate natural gas pipeline projects would have limited, although in some cases significant, adverse environmental impact. Three environmentally superior configurations of the proposed interstate systems were developed. The Mojave proposal or El Dorado ~~proposals~~ alternative utilizing the El Paso 600 MMcfd and Northwest 100 MMcfd Expansions would represent the best Mojave or El Dorado systems from an environmental perspective. The Kern River system utilizing both the Wasatch and North Las Vegas Variations would be the environmentally superior Kern River route.

Within California, each of the project routings was compared to see if one applicant had chosen a superior location for its pipeline. Where this was the case, the EIR/EIS identified this location as being the one that should be used if any of the proposals are approved. The environmental staff feels that on environmental grounds any of these systems could be made acceptable. However, economic and other non-environmental factors may play an important role in determining which of these projects would be best. Consideration of these factors is beyond the scope of this EIR/EIS; however, they will be given full consideration in the later phases of the certification process.

The environmentally preferred interstate proposals ~~are~~ is the Mojave ~~or El Dorado~~ System with the route modifications described in the EIR/EIS. This conclusion is based on two major premises: (1) these systems would involve significantly less environmental impact even if built with all supply projects as proposed; and (2), the supply projects of El Paso and Transwestern could be phased to match actual market requirements as the market evolves.

The first premise results from the fact that Kern River entails substantially more miles of pipeline construction and substantially more compression, crosses sensitive environmental areas, crosses one of those areas in a location which will be difficult if not impossible to construct and maintain without long-term environmental impact, and is not immediately adjacent to existing utilities to the extent the other systems are.

In the case of Mojave or El Dorado, no areas of significant construction or maintenance difficulty would be involved on the recommended routes and major portions of the routes would be immediately adjacent to existing pipeline rights-of-way. In addition, the supply lines would be entirely adjacent to existing pipelines and would share significant portions of previously disturbed right-of-way. Moreover, it is the staff's position that the Transwestern Expansion ~~is~~ may be unnecessary since the El Paso system ~~can~~ may be able to supply all of the design requirements of either Mojave or El Dorado with substantially fewer new facilities. The question of El Paso being able to supply the entire volumes is being addressed in the FERC's hearing process. Elimination of the Transwestern Expansion would make the Mojave or El Dorado systems even more environmentally attractive.

Premise number two is simply a reflection of the fact that existing systems may be expanded incrementally as the EOR/cogen market develops. Kern River must impact the environment along the entire proposed right-of-way regardless of the amount of gas initially or ultimately needed for the market. The environment along the El Paso and Transwestern systems involved in the proposed expansion can be impacted incrementally if the market does not materialize instantly at the level specified in the applications. Indeed, if it never attains that level, the environmental impact may be contained at a lower level.

S.4 ENVIRONMENTAL STAFF CONCLUSIONS

In the case of Mojave or El Dorado, no areas of significant construction on mainline [illegible] would be involved [illegible] environmental regions and [illegible] immediately adjacent to existing pipeline rights-of-way. In addition, the supply lines would be entirely adjacent to existing pipelines and would share significant portions of previously disturbed rights-of-way. Moreover, it is the staff's position that the Transwestern Expansion can be undertaken and the El Paso system may be able to supply all of the market requirements of either Mojave or El Dorado with substantially fewer new facilities. The question of El Paso being able to supply the entire volume is being addressed in the FERC's hearing process. Elimination of the Transwestern expansion would make the Mojave or El Dorado systems even more environmentally attractive.

Premise number two is simply a reflection of the fact that existing systems may be expanded incrementally as the market develops. Kern River must build [illegible] the entire proposed plant [illegible] initially or ultimately needed for the market. [illegible] along the El Paso and Transwestern systems [illegible] proposed expansion can be [illegible] incrementally if the market does not materialize instantly at the level proposed in the applications. Indeed, if it never reaches that level, the environmental impact may be contained at a lower level.

Through detailed analysis, each of the [illegible] crossings was compared to see if one applicant had chosen a superior location for its pipeline. Where this was the case, the EIR/EIS identified this location as being the one that should be used if any of the proposals are approved. The environmental staff feels that on environmental grounds any of these systems could be made acceptable. However, economic and other non-environmental factors may play an important role in determining which of these projects should be used. Consideration of these factors is beyond the scope of this EIR/EIS; however, they will be given full consideration in the later phases of the certification process.

The environmentally preferred interstate proposals are in the Mojave or El Dorado systems with the route modifications described in the EIR/EIS. This conclusion is based on two major premises: (1) these systems would involve significantly less environmental impact even if built with all supply projects as proposed; and (2), the supply projects of El Paso and Transwestern could be phased to match actual market requirements as the market evolves.

The first premise results from the fact that Kern River entails substantially more miles of pipeline construction and substantially more compression, crosses sensitive environmental areas, crosses one of those areas in a location which will be difficult if not impossible to construct and maintain without long-term environmental impact, and is not immediately adjacent to existing utilities to the extent the other systems are.

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC) and the California State Lands Commission (SLC) have prepared this Environmental Impact Report/Statement (EIR/EIS) which presents facts pertaining to the construction, operation, and maintenance of competing projects to supply natural gas to the Kern County, California, area to generate steam for injection in the enhanced oil recovery (EOR) and cogeneration processes. The competitors and their applications before the Federal Energy Regulatory Commission are the following:

Mojave Pipeline Company	Docket No. CP85-437-003
Kern River Gas Transmission Co.	Docket No. CP85-552-002
El Dorado Interstate Transmission Co.	Docket No. CP86-205-001
Northwest Pipeline Corporation	Docket No. CP85-625-001
El Paso Natural Gas Company	Docket No. CP86-197-003
Transwestern Pipeline Company	Docket No. CP86-212-001

These proceedings were consolidated and set for comparative hearing under the lead docket of Mojave Pipeline Company, et al., Docket Nos. CP85-437-000, et al. by FERC Order issued May 19, 1986. The instant EIR/EIS analyzes the projects as proposed as well as any alternatives or variations to the proposed action, and the resulting environmental impacts. It provides pertinent information in sufficient detail for the public to understand the project and for the decision-making body to make a knowledgeable and reasoned decision.

The EIR/EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Council of Environmental Quality's (CEQ) regulations for implementing NEPA, effective July 30, 1979. The State Lands Commission is the lead agency for preparation of an EIR pursuant to the California Environmental Quality Act (CEQA). There are ~~four~~ five volumes in the EIR/EIS as detailed in Section 1.3.2 of this introduction.

Approximately 1,300 copies of the Final EIR/EIS are being circulated to various federal, state, and local government agencies, elected officials, environmental groups and organizations, the media, universities, local libraries, private citizens, and all parties to FERC's proceeding. Due to the length of the list of names and addresses receiving the Final EIR/EIS, the list is not reproduced in this document. Copies of the list are available for viewing at the SLC in Sacramento, California, and FERC in Washington, D.C.

1.1 PROJECT OBJECTIVE AND NEED

Two projects, the Mojave Pipeline Project (Mojave) and the Kern River Project (Kern River), are competing to transport natural gas from various sources outside of California to the Bakersfield, California, area for use in enhanced oil recovery and related cogeneration (EOR/cogen) projects. The El Dorado Project (El Dorado) is considered to be an alternative to these two but is not a competitor.[1] Applications for approval of these projects have been filed with the Federal Energy Regulatory Commission pursuant to Section 7(c) of the Natural Gas Act. In each case, producers of crude oil in the San Joaquin Valley would use the natural gas as boiler fuel to create steam which would be injected into the oil fields to produce crude oil not recoverable by primary recovery methods. Some of the steam would also be used to generate electricity. The producers currently use crude oil and a limited amount of natural gas for steam generation. These proposed projects would allow substitution of natural gas for the crude oil now used, and may allow entry into the market of producers who presently cannot get authorization to burn oil because of air pollution restrictions. Additional applications by El Paso Natural Gas Company (El Paso), Transwestern Pipeline Company (Transwestern), and Northwest Pipeline Company (Northwest) involve facilities to deliver gas to the competitors.

Mojave has proposed to construct and operate a natural gas pipeline project that could transport an average quantity of 600 MMcf per day on a contract basis, from interconnections with the existing Transwestern and El Paso pipelines near Topock, Arizona, to heavy oil fields in the Kern County area of central California. El Dorado has proposed a similar project that could transport an average quantity of 520 MMcf per day. Transportation would be provided for contract shippers who have acquired title to the gas at or upstream from Topock, and who will use such gas in connection with EOR/cogen projects.

The Kern River Gas Transmission Company has proposed a natural gas pipeline that could transport an average quantity of 700 MMcf per day on a contract basis commencing at a point of interconnection with the mainline facilities of Northwest near Opal,

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[1] On October 27, 1986, Administrative Law Judge Isaac D. Benkin of the FERC ordered that the El Dorado application be dismissed with prejudice. Actual dismissal was subject to the Commission's review. On October 20, 1987, the Commission adopted the initial decision of the Administrative Law Judge, dismissed the El Dorado application, and terminated the dockets before FERC. Also, on June 30, 1987, the California State Lands Commission denied, without prejudice, El Dorado's application. Due to the timing of this EIR/EIS, a decision was made to leave the information on El Dorado in the final EIR/EIS to allow the reader to judge El Dorado as an alternative to the two remaining companies in competition.

Wyoming, to Kern County. Transportation would again be provided for contract shippers who would use such gas for EOR/cogen projects. For those EOR shippers who need assistance in securing necessary gas supplies, Kern River Gas Supply Corporation has been formed to facilitate making gas supplies available.

The various project sponsors have conducted extensive surveys of the potential market for natural gas by EOR users in central California. Approximately 18 producers have expressed a desire to obtain firm supplies of interstate natural gas for steam injection to produce heavy oil. The larger of these producers include Texaco, Chevron, Shell, Santa Fe, Mobil, Unocal, and Sun.

The EOR users are attracted to natural gas because of environmental constraints on the burning of additional crude oil and the lower capital, operational, and maintenance costs associated with the use of gas. A number of the larger volume EOR users have stated that only an interstate pipeline dedicated to their market will provide adequate assurance of supply reliability and tariff predictability, which they need to support their oil producing projects.

The Mojave and El Dorado pipelines and associated facilities of Transwestern and El Paso would have access to most of the major gas-producing regions of the nation including Texas, Louisiana, Oklahoma, New Mexico, and off-shore Gulf of Mexico as well as to sources of gas imports from Canada and Mexico. The EOR producers therefore could look to most of North America for the gas supplies needed for their projects.

Kern River expects that the principal supplies for its project would come from uncommitted reserves in the Rocky Mountain area and western Canada. Through its proposed interconnection with Northwest, which runs northwesterly through the Rocky Mountain area to its Canadian border interconnection with West Coast Transmission Company Limited (West Coast) near Sumas, Washington, Kern River could provide heavy oil producers with direct access to Rocky Mountain and Canadian supplies which could provide uncommitted long-term supplies for transportation through the Kern River system.

As shown in Table 1.1-1, Mojave has estimated that EOR/cogen gas requirements in the Kern County area will increase to 1019 MMcfd by 1990. This increase would result from substitution of natural gas for crude oil as fuel for steam generators and from increased crude oil production. Steam production requirements for 1986 were projected conservatively by Mojave to equal requirements for the 12 months that ended September 1984, as shown in Table 1.1-2.

The projected steam production requirement for 1990 is based on information provided by individual oil producers, the California Division of Oil and Gas, and from published industry reports. Table 1.1-3 shows projected 1990 steam production requirements, in natural gas equivalent volumes, for many of the potential oil

Table 1.1-1

PROJECTED NATURAL GAS DEMAND AND SUPPLY FORECAST FOR KERN COUNTY, CALIFORNIA

(volumes in MMcfd equivalent at 1050 Btu/cf)

Demand	1986	1987	1988	1989	1990	1991
Gas Need for EOR [1]	678	666	672	637	662	662
Total Gas Need for Cogeneration	92	165	235	357	357	357
TOTAL DEMAND	770	831	907	994	1019	1019
Supply						
Interstate Pipeline Transportation	0	0	0	550	600	600
Local Non-utility Gas	190	180	170	160	150	140
Crude Oil, Utility Gas Sales and Exchange	580	651	737	284	269	279
TOTAL SUPPLY	770	831	907	994	1019	1019

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[1] Total gas need for steam for EOR includes a portion of the gas used for cogeneration because byproduct steam from cogeneration is used for EOR. The 1986 and 1990 figures of 678 and 662 were derived from the 724 and 825 figures of Tables 1.1-2 and 1.1-3 by subtracting the by-product steam components of 46 and 163, respectively. This steam component is included in the "Total Gas Need for Cogeneration."

Modified from Mojave Pipeline Company [1985]

Table 1.1-2

HISTORICAL ENERGY REQUIREMENT TO GENERATE EOR STEAM IN KERN COUNTY, CALIFORNIA

Year	Steam [1] Injection (MBbls/yr)	Energy [2] Content (TBtu/yr)	Energy [3] Requirements (MMcfd)
1979	301491	111	386
1980	414867	154	536
1981	524825	195	678
1982	554911	206	717
1983	554927	206	717
12 mos ended 9/84	559800	208	724

1/ California Division of Oil and Gas records
2/ 42 gal/Bbl * 8.33 lb/gal * 1060 Btu/lb
3/ Gas equivalent: (TBtu/yr)/(1050 Btu/cf)/(365 d/yr)/(.75 efficiency)

Table 1.1-3

ESTIMATED 1990 FUEL REQUIREMENT FOR STEAM GENERATION IN THE EOR MARKET
(volume in MMcfd at 1050 Btu/cf)

Producer	Estimated Fuel
Texaco	295
Chevron	190
Shell	150
Santa Fe	35
Mobil	45
Sun	25
Union	25
Small Producers	60
Total EOR Market for Steam	825

Source: Mojave Application

producer customers. Steam production requirements for 1987 through 1989 were interpolated from 1986 and 1990 figures.

Table 1.1-1 indicates a projected need for 600 MMcfd of additional natural gas for steam generation by 1990, depending on the amount of crude oil displaced as fuel.

The EIR/EIS takes no position on the accuracy of the projected markets. Various parties have projected a variety of natural gas requirements for EOR use, depending on the time frame and a number of other assumptions including energy costs. Given the existing decline in the demand for gas in the EOR market, there have been comments suggesting that non-EOR use may be needed to support the proposed projects. This EIR/EIS is not the vehicle to resolve these positions and the other issues associated with need. These are the subject matter of the hearings presently before FERC (see further discussions of the FERC hearing process in Sections 1.2.1 and 1.2.2).

Each of the interstate projects, when implemented, can be expected to have certain impacts in Kern County arising out of the expansion of net crude oil production and the construction and operation of new facilities.

Where existing gas delivery lines are inadequate to transport the gas to the steam-flooding operations, new lines would be built. Construction of new gas delivery lines would create the environmental impacts typically associated with such construction. Construction impacts would be localized, of short duration and, due to the fact that many gas and oil delivery lines already exist in Kern County, are not likely to be significant. In many cases, they could be confined to existing rights-of-way. At this stage of the projects, it is impossible to predict how many such lines would be constructed or where they would be built. The increased availability of gas in Kern County also may contribute to significant expansion of cogeneration facilities in Kern County.

Given the demands for service being voiced by gas users who are not EOR producers, it is possible that new facilities would be required to connect the interstate pipeline to the systems of the local utilities for delivery to non-EOR customers. As in the case of gas delivery lines, it is premature to speculate on how many such facilities would be built or where they would be located. This is particularly true since none of the interstate pipeline applicants has formally applied for authority to serve non-EOR customers. It is reasonable to assume, however, that any delivery lines for service to non-EOR customers would be similar in character to those needed for service to EOR customers. In addition, FERC approval would be needed and the environmental impacts would be analyzed at that time.

If new facilities other than pipelines are built, there would be localized and temporary construction impacts. The principal result of operating any new cogeneration or compression facilities would be the emission of air pollutants, particularly oxides of nitrogen (NOx), a precursor of ozone.

At the present time, Kern County is designated as a non-attainment area for ozone. Air pollution impacts of any new construction would be regulated under the Federal Clean Air Act, and would be subject to the regulations of the Kern County Air Pollution Control District. New sources emitting significant NOx emissions would be subject to the requirement to obtain offsets from other emission sources on a better than one-for-one basis. In addition, permits for new construction would impose emission requirements based upon Best Available Control Technology. Application of these requirements can be expected to minimize impacts of new sources.

Offsets most likely would be provided by oil-fired steam generators currently used by the EOR producers. Because sulfur dioxide (SO2) and particulate matter (PM) emission associated with a given level of NOx emissions are higher from oil-fired equipment than from gas-fired equipment, even one-to-one NOx offsets are likely to result in net reductions of SO2 and PM emissions.

Conversion of oil-fired steam generators currently used for EOR to gas would result in a substantial increase in net production of crude oil, since crude oil now being burned as fuel in a ratio of one barrel in four would be available to be sent to refineries instead. In addition, the supplies of gas at economic prices may stimulate an expansion of crude-producing activities. This expanded crude production would require an expansion of transportation, handling, and refinery activity. Given the uncertainties inherent in the world crude oil market and the degree to which refiners may simply cut back on imports or purchases of crude oil from other sources in order to accommodate additional Kern County production, it is premature to further analyze the specific impacts in this sector which the additional Kern County production may have.

The project, by making it possible to ship large volumes of gas, would stimulate gas supply activities and may result in the development of new gas fields and facilities to extract, treat, and transport such gas to the pipeline. At this stage in the project, it is too early to describe the extent of such new facilities or their specific locations.

The facilities involved in a gas field include drilling rigs, wellhead equipment, gathering lines, treatment plants, field compression units, and delivery lines. Since one cannot predict with certainty at this stage where any new facilities would be located, it is premature to attempt a more precise analysis of such facilities at this time.

1.2 PERMITS AND REGULATORY REQUIREMENTS

1.2.1 Background

Under Section 7 of the Natural Gas Act the FERC has sole responsibility for determining that interstate natural gas transportation facilities are in the public interest. If the FERC determines that there is or will be a need for a proposed service, it will issue a certificate of public convenience and necessity authorizing a proposed project. Until the FERC makes a decision based on a fully developed record, the need for a proposed project has not been established. This record will result from a formal public hearing which will examine every aspect of construction and operation of the proposed projects. Environmental impacts are an important and integral part of the overall examination. A certificate or certificates will be granted only if the Commission finds that the evidence produced on technical competence, financing, capitalization, rates, market demand, gas supply, existing facilities and service, impacts on existing interstate service, impacts on existing intrastate service, impacts on existing electric utility service, environmental impacts, impacts on oil production, and the long-term feasibility of the projects demonstrated that a project or projects were required by the public convenience and necessity.

In this proceeding the presence of the competing proposals complicates matters since, if a need exists, the FERC must decide which project(s) would most appropriately fill that need and the level of service to be provided. This latter issue, i.e., "firmness" of service, is particularly outside the scope of the EIR/EIS. Various parties have argued that all the projects (including the intrastate systems) must be compared at the same level of service, and that the standard for comparison be that level alleged by Kern River, i.e., 100% firm service to the EOR market. Such an approach would mean that at least El Paso (a partner to Mojave) and possibly the intrastate alternative would have to add significantly more pipeline to their proposals. This line of reasoning would engage the staff in the comparison of impacts associated with purely fictitious facilities in an attempt to satisfy a standard for which support has not yet been demonstrated and may never be required. None of the other applicants have proposed in their applications to offer service identical to that proposed in Kern River's application. None of the oil producers have testified that 100% firm service is essential (versus a desire). Whether Kern River can provide its alleged level of service will also need to be demonstrated in the FERC proceeding. In short, a proposal for less than 100% firm service does not mean more facilities are required on a company's system; it simply means the other company is not providing similar service. In the final analysis, the producers who subscribe to the service being offered by the applicants/intrastate transporters will determine precisely the level of service necessary and at what cost. At this time, the staff sees no reason to change the design of the projects.

If one of these projects is approved by the FERC, then a host of additional permits must be obtained by the successful applicant. These requirements are summarized in Section 1.2.3, and include rights-of-way (ROW) and temporary use permits from the Bureau of Land Management (BLM), and the U.S. Forest Service (FS) where appropriate.

1.2.2 Environmental Review Process

NEPA requires all federal agencies to take into consideration the environmental effects of their actions. When those actions involve projects that are found to be major federal actions significantly affecting the quality of the human environment, the agency must prepare an environmental impact statement (EIS) describing the effects and how it intends to minimize them. The State of California has similar requirements to prepare an environmental impact report (EIR) under CEQA.

Because of the original number of competing applications and permitting agencies which must perform environmental analyses prior to issuing permits, it was apparent that much duplication could be avoided by preparing a joint EIR/EIS under the direction of a lead federal agency, FERC, and a lead state agency, SLC, to satisfy the requirements of all agencies. Such a procedure is encouraged by the regulations of the CEQ. Agencies which have requested cooperating agency status as defined in the CEQ regulations include:

Advisory Council on Historic Preservation

Department of Agriculture:
  Soil Conservation Service
  U.S. Forest Service

Department of Defense:
  Department of the Air Force
  Department of the Army
  U.S. Marine Corps
  Corps of Engineers

Department of the Interior:
  U.S. Fish and Wildlife Service
  Bureau of Indian Affairs
  National Park Service
  Bureau of Land Management

Department of Transportation:
  Federal Highway Administration

Interstate Commerce Commission

The first step in the EIS process is to publish a Notice of Intent (NOI) for the preparation of an EIS in the Federal Register. The first NOI for the Mojave-Kern River Natural Gas Pipeline Project was published on August 23, 1985 and supplemented on December 10, 1985, and May 12 and June 25, 1986. The first step in the EIR process is the publication of a Notice of Preparation (NOP). The FERC and SLC circulated the NOI and NOP to all affected federal, state, and local agencies potentially concerned with the proposed pipelines.

The second step in the EIR/EIS process is termed scoping. The purpose of scoping is to determine the significant issues and concerns related to a proposed action which should be included in the EIR/EIS. Public meetings were used to supplement written scoping comment resulting from the NOI/NOP and to identify major issues and concerns. During February 1986, six scoping meetings were held at Albuquerque, New Mexico; Flagstaff, Arizona; Barstow, California; Bakersfield, California; Heber City, Utah; and Las Vegas, Nevada. An additional scoping meeting was held in Grand Junction, Colorado, in July 1986. [A total of about 100 people attended these meetings.] Separate meetings were also held with various federal agencies and the Laguna and Navajo Indian tribes.

A FERC representative opened each meeting by explaining the meeting's purpose and the roles of the federal, state, and local governments and of the project proponents. The proponents then described their respective projects using slides and maps. A question-and-answer period followed during which major concerns and issues were identified. Written concerns could also be mailed to the FERC. Additional concerns of the cooperating agencies were also included for discussion purposes. The issues of high and medium concern were discussed in the draft EIR/EIS. Copies of the transcripts of the scoping meetings are available for viewing at the SLC in Sacramento and FERC in Washington, D.C. The final EIR/EIS addresses all substantive comments received.

The third step in the process was the publication and circulation of the draft EIR/EIS for comment. The Environmental Protection Agency noticed the availability of the draft EIR/EIS on January 23, 1987. Approximately 1,300 copies of the draft EIR/EIS were sent to various federal, state, and local government agencies, Indian tribes, elected officials, environmental groups and organizations, the media, universities, local libraries, private citizens, and all parties to the FERC proceeding. Copies were also available for review at both FERC and SLC. The closing period for comments was April 24, 1987. Additional comments came in well into June 1987. All comments as well as staff's response to these comments are reproduced in Volume V of this EIR/EIS. In isolated cases, large amounts of background information was provided with the letters of comment, e.g., U.S. Borax and Chemical Corporation's comments. This background information is not reproduced in Volume V but is available for public review either at FERC or the SLC. Public meetings to receive comments on the draft EIR/EIS were also held during the week of March 23, 1987, in Bakersfield and Barstow, California; Las Vegas, Nevada; and Salt Lake City, Utah. Transcripts of these proceedings as well as any appropriate staff response are also reproduced in Volume V.

The fourth step in the process is the publication of the final EIR/EIS. Copies of this final EIR/EIS are available for review in the FERC Division of Public Information, Room 1000, 825 North Capitol Street, N.E., Washington, DC 20426, and at the SLC, 1807 13th Street, Sacramento, CA 95814. Copies have been sent to those who received the draft EIR/EIS and to additional addresses received during the comment period. Limited quantities are also available at the above addresses. Additional information about the project or this EIR/EIS is available from Mr. Robert Arvedlund, FERC Project Manager, Environmental Evaluation Branch, Office of Pipeline and Producer Regulation, telephone (202) 357-9043 or Ms. Mary Griggs, SLC Project Manager, telephone (916) 322-0354.

The final steps in the process vary. As discussed in Section 1.2.3, the successful applicant(s) would be required to obtain permits and approvals from a variety of federal, state, and local agencies, and Indian tribes. This would occur after the FERC certification process is completed. On May 19, 1986, FERC consolidated the proceeding and set the various applications for hearing. During the past year, the applicants, the intervenors, the FERC staff, and the Administrative Law Judge have been involved in discovery proceedings. Direct, answering, and rebuttal testimony on environmental and non-environmental issues has been filed before FERC, and after each phase of filing has been completed, the parties engaged in extensive discovery hearings. This process included discovery arguments, motions to compel discovery, oral arguments of the motions to compel, and interlocutory appeals. After a year of pretrial proceedings, the hearing began on September 9, 1987. The hearings have been divided into two phases. Phase 1, which began September 9, 1987, will deal with all issues other than environmental issues, which will be dealt with in Phase 2. Some of these non-environmental issues are identified in Section 1.2.1.

At or before the start of Phase 2 of the FERC hearing process, the final EIR/EIS will be entered as an exhibit into the hearing with accompanying staff testimony sponsoring the exhibit. The staff, as well as others sponsoring environmental exhibits, will be subject to cross-examination. The ultimate purpose of Phase 2 will be to determine the adequacy of the EIR/EIS and whether it satisfies the requirements of the National Environmental Policy Act of 1969. The Administrative Law Judge will make an initial decision on the adequacy of the EIR/EIS. The Commission must ultimately decide this in issuing its certificate of public convenience and necessity.

Federal permitting agencies who would be most extensively involved with these projects following issuance of a FERC certificate would be the BLM and the FS. The BLM would issue ROW grants for all federal lands including those administered by the FS.

The federal ROW grants would contain general mitigation measures. After the ROW grant is signed, the applicant(s) would submit a detailed construction, operation, and maintenance (COM) plan to the designated federal authorized officer for review by the agencies. The COM plan would be developed for federal lands in accordance with applicable federal regulations [43 CFR Part 2882.2-4(c): Management of Oil and Natural Gas Pipelines and Related Facilities]. At a minimum the plan would include:

o Schedules for construction of the pipeline and all related facilities and estimated construction costs,

o Plans for the protection of the environment during construction, operation, and maintenance and abandonment of the pipeline,

o Plans for emergency repair of any rupture during operation and restoration of damage.

The BLM and other cooperating agencies would also conduct an environmental and engineering review of the COM plan. Where environmental impacts cannot be mitigated, the applicant(s) may be required to undertake minor realignments of the pipeline. If this realignment is outside of the one-mile analysis corridor addressed in the EIR/EIS, an amendment to the EIR/EIS may be necessary. Following this review and determination by the authorized officer and cooperating agencies that pre-construction mitigation measures have been completed, a Notice to Proceed would be issued. The Notice to Proceed may also contain mitigation developed as a result of archaeological and biological surveys of the pipeline centerline and adjacent land.

Construction of a gas pipeline along portions of Mojave's proposed route across the Mojave Desert in San Bernardino County would not be in conformance with the BLM's California Desert Plan [1980] as it is not completely within designated corridors. The Plan designated several utility corridors across the desert to accommodate several different types of utility facilities. Utility needs not conforming with designated corridors may be allowed only through the BLM's plan amendment process. Due to the lack of conformance by Mojave, the Plan may have to be amended to allow approval.

The Plan could be amended through this EIR/EIS and subsequent Record of Decision. The amendment process requires a number of steps, including publication of a Notice of Intent and Notice of Availability of Planning Criteria in the Federal Register, preparation of an EIS or an Environmental Assessment, public review (90 days), and preparation of a Record of Decision (ROD) formally amending the Plan. This EIR/EIS is intended to accomplish the EIS and public review steps in the event Mojave is chosen and is allowed to use a route outside of designated corridors. Should BLM and FERC decide to allow Mojave to use a route outside of a corridor, BLM would issue a Record of Decision at the time the ROW grant is issued. This ROD would document BLM's decision and the rationale for allowing construction outside the corridor system. The ROW grant would indicate that the decision was approved through the plan amendment process.

A similar process would likely be required for Kern River, which does not follow approved corridors on National Forest System lands in Utah. The procedures used in this case would be slightly different from those used in the California Desert Conservation Area and are described in Appendix F of Volume II. Forest Plan amendments would have to be completed and approved prior to issuance of the BLM ROW grant. The Forest Service has stated that approval of these amendments would only be considered when all of the following items had a positive finding in the NEPA process and the Federal Energy Regulatory Commission certification process:

- The pipeline is found to be a legitimate use of National Forest System land.
- The Kern River project is shown to be essential to public welfare and is needed to meet increased local, regional, or national demand for oil recovery or other energy requirements, or is shown to result in a substantial increase in net public benefits.
- The Kern River project is shown to be the preferred alternative.

Cultural resource protection and American Indian concerns were major issues discussed among FERC, BLM, Forest Service, Indian tribes, the Advisory Council on Historic Preservation (Advisory Council), and the various State Historic Preservation Officers (SHPOs). Agencies such as BLM and the Forest Service typically enter into a written Programmatic Memoranda of Agreement (PMOA or MOA) with the SHPOs and the Advisory Council to carry out their responsibilities under the National Historic Preservation Act. For a variety of reasons, the FERC rarely enters into such PMOA or MOA arrangements, but certainly does not neglect its responsibilities under the Act. In the instant case, the FERC is the lead federal agency which has and will continue to coordinate with the above agencies and tribes to afford protection to cultural resources and address American Indian concerns. Because of the original number of competing applications, a decision was made to limit the type of review in this EIR/EIS to that associated with a BLM Class I analysis. When and if an applicant is certificated by FERC, additional work (including Class II and III analyses) will be conducted with FERC as the lead responsible federal agency. This will be coordinated with all the above entities. In such a manner, cultural resources will be afforded protection and American Indian concerns will be addressed; however, a PMOA or MOA will not be, nor does it have to be, the vehicle to achieve this.

1.2.3 Summary of Permits Required

The successful applicant(s) would be required to obtain permits and approvals from a variety of federal, state, and local agencies and Indian tribes. Major permits or approvals are listed in Tables 1.2-1, 1.2-2, and 1.2-3.

The SLC would act on ROW permits for lands under its jurisdiction. Other public agencies will use the final EIR/EIS as the basis for their decisions to issue approvals/permits that they are to grant for the project. State agencies in California, Arizona, New Mexico, Texas, Colorado, Utah, Nevada, and Wyoming would act on ROW permits for lands under their respective jurisdictions, and may use the EIR/EIS, although this document is not a prerequisite to ROW grants in those states. In addition to the federal and state authorizing actions, all necessary county and local regulations with regard to pipeline construction and operation would have to be addressed and adhered to by the successful applicant(s).

1.3 ORGANIZATION OF THE REPORT

1.3.1 General Description

Because of the complexity of the competing and interrelated proposals, and the special needs of specific agencies, several documents have been prepared to address fully the environmental impact associated with each proposal. The EIR/EIS (Volumes I through V) is the primary NEPA document; it includes full descriptions of all proposals and alternatives, as well as discussions of project-specific impact and cumulative impact. Mitigation measures are presented, their effectiveness evaluated, and unavoidable impacts identified. Where required by other statute or request, separate technical reports have been prepared which provide further details for analyses contained in the EIR/EIS. For the EOR proposals separate technical reports were prepared to document 1) air quality impact, primarily ozone projections in the Kern County airshed resulting from fuel conversion by the EOR industry, 2) potential impact to federally and California state listed or proposed threatened and endangered species, 3) potential impact to cultural and historic resources, and 4) potential impact to paleontological resources. The results of these analyses are summarized in the EIR/EIS; the technical reports themselves are not being distributed to the public. In the cases of threatened and endangered species and cultural and paleontological resources, this measure is being

Table 1.2-1

KEY FEDERAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant[1/]					
			MO	ED	EP	NW	TW	KR
DEPARTMENT OF AGRICULTURE								
Forest Service	Concur with the BLM pipeline right-of-way grant and notices-to-proceed prior to issuance for National Forest System lands	Construction of pipeline and access roads			X		X	X
	Issue special use permits for construction activities outside of the pipeline right-of-way and related facilities as defined by 43 CFR Subpart 2880	All project features			X		X	X
	Issue permits for removal of commercial and noncommercial timber and other forest products	Removal of commercial wood products on FS lands			X		X	X
DEPARTMENT OF INTERIOR								
Bureau of Land Management	Issue federal ROW grant	Pipeline, access roads, power transmission lines, compressor stations	X	X	X	X	X	X
	Issue temporary use permit for construction ROW	Temporary construction activities, staging areas	X	X	X	X	X	X
	Issue non-competitive mineral material sales contract	Aggregate for compressor station construction, access road construction	X	X	X	X	X	X
	Issue antiquities permits and permits to excavate or remove archaeological resources on public lands under FLPMA and ARPA	All project features	X	X	X	X	X	X
Fish and Wildlife Service	Issue biological opinion on threatened, endangered or proposed species of fish, wildlife, or plants as part of Section 7 of Endangered Species Act for all federal actions	All project features	X	X	X	X	X	X
Bureau of Indian Affairs	Issue BIA ROW grant	Pipeline and access roads across Laguna, Navajo, Fort Mojave, and Moapa lands	X	X	X		X	X
	Issue permit to use tribal water supplies	Hydrostatic testing	X	X	X		X	
	Issue permit to cross Trust Lands and Allotted Lands	Pipeline, access roads	X	X	X		X	
	Issue permit to excavate and remove archaeological resources on BIA and Indian Lands	All project features	X	X	X		X	X

Table 1.2-1 (continued)

KEY FEDERAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant					
			MO	ED	EP	NW	TW	KR
DEPARTMENT OF INTERIOR (continued) Bureau of Reclamation	Issue special land use license or easement	Pipeline crossing Las Vegas Wash						X
	Issue special land use permit	Pipeline, access roads				X		X
DEPARTMENT OF DEFENSE Army Corps of Engineers	Issue nationwide and individual permit(s) (Section 404) for placement of dredged or fill material in waters of the U.S. or their adjacent wetlands	River or stream crossings for pipeline and access roads	X	X	X	X	X	X
U.S. Air Force	Issue easement to cross DOD lands; individual base commanders have final approval	Pipeline and access roads across Edwards and Nellis Air Force Base, Elk Hills Naval Petroleum Reserve, and Fort Irwin	X	X				X
DEPARTMENT OF TRANSPORTATION Federal Highway Administration	Issue permits to cross Federal Aid Highways	Pipeline, access roads	X	X	X	X	X	X
ENVIRONMENTAL PROTECTION AGENCY	Issue NPDES permits for wastewater discharges	Any discharge of hydrostatic test water	X	X	X	X	X	X
FEDERAL COMMUNICATIONS COMMISSION	License to operate industrial radio service	License for each repeater station	X	X	X	X	X	X
FEDERAL ENERGY REGULATORY COMMISSION	Certificate of Public Convenience and Necessity	Pipeline construction and operations	X	X	X	X	X	X
DEPARTMENT OF ENERGY	Consultation of crossing roads and waterlines associated with Waste Isolation Pilot Project	Pipeline, access road					X	

1/ MO = Mojave; ED = El Dorado; EP = El Paso; NW = Northwest, TW = Transwestern, KR = Kern River

Table 1.2-2

KEY STATE AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant MO	 ED	 EP	 NW	 TW	 KR
ARIZONA								
State Lands Commission	Issue ROW easement permit to cross state lands	All project components	X	X	X		X	
Department of Health Services:								
Bureau of Air Quality Control	Issue installation permit to locate facilities with the potential to emit over 75 tons of emissions per day	Compressor station(s)	X		X			
State Water Resources Board	**Issue permit for water appropriation and disposal or discharge of wastewater**	**Hydrostatic testing water appropriation and discharge**	**X**	**X**	**X**		**X**	
Bureau of Water Quality Control	Issue permit for the disposal or discharge of hydrostatic testing water	Hydrostatic testing of pipeline	X	X			X	
Commission of Agriculture and Horticulture	Issue permit for the removal of commercially valuable cactus from ROW on state owned land	Pipeline, access roads	X	X	X		X	
Department of Transportation	Issue permit to cross or encroach ROW of highways under state jurisdiction	Pipeline, access roads	X	X	X		X	
Arizona State Museum	Issue State Museum permit to conduct work upon state lands, cultural resource clearance	All project components	X	X	X		X	
CALIFORNIA								
Department of Fish and Game	Issue stream alteration agreement	Possible alterations of stream courses	X	X				X
	Issue MOU to handle and move desert tortoise	All project components	X	X				X
	Issue biological opinion on state rare and endangered species	Pipeline, access roads	X	X				X
Department of Transportation	Issue permits to cross state and interstate highways	Pipeline, access roads	X	X				X
Office of Historic Preservation	Issue cultural resource clearance	All project components	X	X				X
Office of Safety and Health Administration	Issue construction permit with attached safety standards	All project components	X	X				X
Air Resources Board	Issue permit to construct and operate	All project components	X	X				X
Colorado River Basin Regional Board	Issue permit for water discharge	Any discharge of hydrostatic test water	X	X				X
State Water Resources Board	Issue permit for water appropriation and disposal or discharge of wastewater	Hydrostatic testing water appropriation and discharge	X	X				X

Table 1.2-2 (continued)

KEY STATE AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant					
			MO	ED	EP	NW	TW	KR
CALIFORNIA (continued)								
Department of Water Resources	Issue permit to encroach or cross the California Aqueduct	Pipeline, access roads	X	X				X
Reclamation Board	Issue encroachment permit to Central Valley Flood Control Plan	Pipeline and access roads crossing Kern River	X	X				X
State Lands Commission	Issue ROW permit to cross state lands (Land Use Lease Permit)	All project components	X	X				X
COLORADO								
Department of Health	Issue fugitive dust emission permit	Pipeline, access roads				X		
	Issue emission permit	Construction and operation of compressor station(s)			X	X		
	Issue discharge permit	Discharge of hydrostatic test water				X		
State Water Resources Department	Issue water appropriation permit	Use of water for hydrostatic testing				X		
State Historic Preservation Office	Issue archaeological clearance	All project components				X		
State Highway Department	Issue highway crossing permits	Pipeline, access roads				X		
Colorado Division of Wildlife	Issue right-of-way easement	Pipeline, access roads				X		
District Water Courts	Issue permit for water rights	Water appropriation for hydrostatic testing				X		
NEVADA								
Department of Conservation and Natural Resources/Division of Environmental Protection	Issue of NPDES permit for hydrostatic test discharge	Any discharge of hydrostatic test water						X
	Issue land clearing permits for state lands	Pipeline, access roads						X
	Issue permit to dispose of sewage and/or solid wastes	Pipeline construction, compressor stations						X
	Issue permit to develop a private water supply	Hydrostatic testing and compressor stations						X
State Engineer	Issue permit to drill a water well	Hydrostatic testing						X
Department of Transportation	Issue permits to cross state and interstate highways or use existing highway right-of-way	Pipeline, access roads						X
State Historic Preservation Office	Issue cultural resource clearance	Pipeline, access roads; clearance required prior to construction						X

Table 1.2-2 (continued)

KEY STATE AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant					
			MO	ED	EP	NW	TW	KR
NEW MEXICO								
State Land Office	Issue ROW easement prior to initiation of activities	All project components			X		X	
Environmental Improvement Division:								
Air Quality Bureau	Issue permit for open burning of cleared vegetation or construction debris	Pipeline, access roads			X		X	
Water Pollution Control Bureau	Issue NPDES permit for disposal or discharge or hydrostatic test water	Hydrotstatic test water disposal					X	
Oil Conservation Bureau	Issue Notice of Intent to discharge, and discharge Plan; permit for disposal of hydrostatic test water	Hydrostatic test water disposal			X		X	
State Engineer	Issue a permit to appropriate the underground waters of the State of New Mexico	Hydrostatic test water appropriation			X		X	
State Highway Department	Issue permit to install utility facilities within public right-of-way	Pipeline, access roads			X		X	
Historic Preservation Division	Issue Historic Preservation Division permit for archaeological survey easement	All project components			X		X	
TEXAS								
Railroad Commission	Issue permit for pipeline operation	Pipeline					X	
General Land Office and School Land Board	Issue easements or leases for rights-of-way across state lands	Pipeline, access roads					X	
Texas Water Commission	Issue permit for surface water diversion and storage	Hydrostatic water appropriation					X	
Texas Railroad Commission	Issue permit for wastewater discharge	Hydrostatic test water disposal					X	
Antiquities Committee	Issue permit for cultural resources survey or reconnaissance	All project components					X	
UTAH								
Department of Health - Division of Environmental Health:								
Bureau of Air Quality	Submit notice of intent to construct	Pipeline, access roads				X		X
	Issue air quality permits	Compressor stations				X		
Bureau of Water Pollution Control	Issue construction permit	Pipeline, access roads, compressor stations				X		X
Bureau of Sanitation	Meet potable water standards	Pipeline, access roads				X		X

Table 1.2-2 (continued)

KEY STATE AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant					
			MO	ED	EP	NW	TW	KR
UTAH (continued)								
Bureau of Solid Waste Management	Issue permit to dispose of sewage and/or solid waste	Pipeline construction				X		X
State Engineer	Issue permit to drill a private water supply well	Hydrostatic testing, water appropriation				X		X
	Issue permit for any stream alteration	Possible stream alterations caused by pipeline or access roads				X		X
	Issue hydrostatic test water appropriation permit	Hydrostatic test water acquisition				X		X
Department of Natural Resources: Division of State Lands and Forestry	Issue ROW permit to cross state lands	Pipeline, access roads				X		X
Department of Transportation	Issue encroachment permit to cross state and interstate highways or use existing utility corridors	Pipeline, access roads				X		X
Division of State History: State Historic Preservation Office	Issue cultural resource clearance	All project components				X		X
WYOMING								
Department of Environmental Quality: Air Quality Division	Issue construction permits for a new source	Compressor station(s)				X		X
	Issue prevention of significant deterioration permit	Compressor station(s)				X		X
Water Quality Division	Issue hydrostatic test discharge	Hydrostatic test water discharge				X		X
State Waste Management	Landfill permit for solid waste disposal	Pipeline construction				X		X
State Engineer	Issue permit to appropriate groundwater	Hydrostatic test water acquisition				X		X
	Issue hydrostatic test water appropriate permit	Hydrostatic test water acquisition				X		X
Recreation Commission: State Historic Preservation Office	Issue cultural resources clearance	All project components				X		X
Public Lands Commission	Issue grant of ROW across state lands	Pipeline, access roads				X		X
State Highway Department	Issue license for encroachment on State highways	Pipeline, access roads				X		X

Table 1.2-3

KEY COUNTY AND LOCAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant MO	 ED	 EP	 NW	 TW	 KR
ARIZONA								
Apache County	Issue permits for road crossing and construction	Pipeline, access roads			X		X	
Coconino County	Issue permits for road crossing and construction	Pipeline, access roads			X		X	
Mojave County	Issue permits for road crossing and construction	Pipeline, access roads	X	X	X		X	
Navajo County	Issue permits for road crossing and construction	Pipeline, access roads			X		X	
Yavapai County	Issue permits for road crossing and construction	Pipeline, access roads			X		X	
CALIFORNIA								
Kern County:								
Board of Supervisors	Issue permit for crossing county roads	Pipeline, access roads	X	X				X
Air Pollution Control Board	Issue air quality permits	All project components	X	X				X
San Bernardino County:								
Flood Control District, Board of Commissions	Issue easement for crossing county drains	Pipeline, access roads	X	X				X
Road Department	Issue excavation permit for crossing county roads	Pipeline, access roads	X	X				X
Board of Supervisors	Issue franchise and excavation permit for encroachment of county roads	Pipeline, access roads	X	X				X
COLORADO								
Dolores County	Issue road crossing and construction permit	Pipeline, access roads, compressor station				X		
Garfield County	Issue a special use permit for pipeline and related facilities	Pipeline, access roads				X		
	Submit an impact statement	Pipeline, access roads				X		
	Issue road crossing and construction permit	Pipeline, access roads				X		
Mesa County	Issue conditional use permit for pipeline and related use facilities	Pipeline, access roads				X		
	Issue road crossing and construction permit	Pipeline, access roads				X		

Table 1.2-3 (continued)

KEY COUNTY AND LOCAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant					
			MO	ED	EP	NW	TW	KR
COLORADO (continued)								
Montezuma County	Issue building permit/plan approval for pipeline and related facilities	Pipeline, access roads				X		
	Issue road crossing and construction permit	Pipeline, access roads				X		
Rio Blanco County	Issue a special use permit for pipeline and related facilities	Pipeline, access roads, compressor station				X		
	Issue road crossing and construction permit	Pipeline, access roads				X		
La Plata County	Issue a special use permit for compressor station	Compressor station			X	X		
NEVADA								
Clark County Board of Commissioners	Issue conditional use permit to cross unincorporated areas	Pipeline, access roads						X
Colorado River Commission	Issue permit for joint occupancy	Pipeline						X
Henderson City Council	Issue conditional use permit to pass through Henderson	Pipeline, access roads						X
Lincoln County	Issue permits for road crossing and construction	Pipeline, access roads						X
NEW MEXICO								
Cibola County	Issue permits for road crossing and construction	Pipeline, access roads					X	
Eddy County	Issue permits for road crossing and construction	Pipeline, access roads					X	
Lea County	Issue permits for road crossing and construction	Pipeline, access roads					X	
Lincoln County	Issue permits for road crossing and construction	Pipeline, access roads					X	
McKinley County	Issue permits for road crossing and construction	Pipeline, access roads			X		X	
San Juan County	Issue permits for road crossing and construction	Pipeline, access roads			X			
Socorro County	Issue permits for road crossing and construction	Pipeline, access roads					X	
Torrance County	Issue permits for road crossing and construction	Pipeline, access roads					X	
Valencia County	Issue permits for road crossing and construction	Pipeline, access roads					X	

Table 1.2-3 (continued)

KEY COUNTY AND LOCAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	Applicant MO	 ED	 EP	 NW	 TW	 KR
TEXAS								
Ward County	Issue road crossing and construction permits	Pipeline, access roads					X	
UTAH								
Beaver County	Issue road crossing permit	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
Grand County	Issue road crossing and construction permit	Pipeline, access roads, compressor station				X		
Iron County	Issue road crossing permit	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
Juab County	Issue road crossing permit	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
Millard County	Issue special agreement for road crossing	Pipeline, access roads						X
	Issue conditional use permit for pipeline and related facilities	Pipeline, access roads						X
	Issue building permit for compressor station	Compressor station						X
San Juan County	Issue conditional use permit for pipeline and related facilities	Pipeline, access roads				X		
	Issue road crossing and construction permit	Pipeline, access roads				X		
Sanpete County	Issue building permit for above-ground structures	Pipeline, access roads						X
Summit County	Issue excavation permit for road crossing	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
	Issue conditional use permit for pipeline	Pipeline, access roads						X

Table 1.2-3 (continued)

KEY COUNTY AND LOCAL AUTHORIZING ACTIONS

Agency	Nature of Action	Project Feature	MO	ED	EP	NW	TW	KR
			Applicant					
UTAH (continued)								
Utah County	Issue road crossing permit	Pipeline, access roads						X
	Issue building permit/plan approval for pipeline and related facilities	Pipeline, access roads						X
Wasatch County	Issue excavation permit for road crossing	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
Washington County	Issue road crossing permit	Pipeline, access roads						X
	Issue building permit for above-ground structures	Pipeline, access roads						X
	Issue conditional use permit for pipeline and related facilities	Pipeline, access roads						X
City of Nephi	Issue road crossing and construction permit	Pipeline, access roads						X
WYOMING								
Lincoln County	Issue county road agreement for road crossing	Pipeline, access roads				X		X
	Issue building permit for above-ground structures	Compressor station						X
	Issue conditional use permit for pipeline and related facilities	Pipeline, access roads				X		X
Sweetwater County	Issue permits for road crossing and construction	Pipeline, access roads, compressor station				X		
Uinta County	Issue road encroachment license for road crossings	Pipeline, access roads						X
	Issue use certificate for above-ground structures	Pipeline, access roads						X

implemented to protect the resources involved from unsupervised collection or disturbance. These reports are not necessary for an understanding of the specific issues addressed in the EIR/EIS. Specific milepost locations where these species and resources may occur have been omitted from this EIR/EIS. The technical reports were sent to the appropriate governmental agencies and will be made available to responsible researchers at their expense. The Cultural Resources Technical Report was provided to the various SHPOs and the ACHP as part of the compliance process for Section 106 of the National Historic Preservation Act. Separate Biological Assessments for each project and their respective route variations/alternatives were prepared and sent to the U.S. Fish and Wildlife Service for comment and formal consultation as part of the compliance process for the Endangered Species Act. The U.S. Fish and Wildlife Service provided a Biological Opinion on the various projects and this opinion is attached as Appendix G to Volume II. The Air Quality/Meteorology Technical Report was primarily done for the California state agencies, particularly the Air Resources Board (CARB) which requested modelling of the air emission effects of converting the fuel used in EOR steam generators from crude oil to natural gas. While the report contains other information including preliminary modelling to determine if PSD review would be required, all the pertinent results have been included in the EIR/EIS. With the exception of the modeling done for CARB, the report is a working document and will not be distributed. Copies may be viewed or reproduced at the requestor's expense at the offices of the FERC and SLC.

1.3.2 Organization

The EIR/EIS is divided into five volumes. Volume I contains project descriptions, environmental baseline and consequences, and mitigation concerning the Mojave, El Dorado, El Paso, and Transwestern proposals and their alternatives. To the extent that facilities would be required on Northwest's system to support an alternative to Mojave's proposal, issues and impact associated with such facilities are covered in Volume I. Use of the California intrastate natural gas pipeline systems as an alternative to Mojave or El Dorado is also addressed.

Volume II contains the project description, environmental analysis, and mitigation for Kern River's proposal (including the interconnection with Northwest), as well as selected route variations and system alternatives. Use of the California intrastate systems as an alternative to or in conjunction with Kern River's proposal is covered.

A detailed discussion of route variations and system alternatives considered but ultimately eliminated from detailed analysis is also presented.

Volume III contains a comparative analysis of ~~all three~~ the two primary interstate proposals, the El Dorado interstate alternative, as well as alternatives including the California intrastate systems. Conclusions and recommendations are presented.

Volume IV is dedicated to map coverage at 1:250,000-scale of all pipeline facilities proposed or required by the interstate pipeline projects as well as those required for alternatives retained for detailed analysis. This volume is not being reproduced for the final EIR/EIS but is incorporated by reference from the draft EIR/EIS. The two maps which required minor modification are Map Nos. 3 and 7 of the Northwest maps. The Vernal compressor station on Map 3 should be moved approximately one inch north along the route and redesignated as an existing compressor station rather than a proposed one. No additional compression is required at this existing station. With respect to Map 7, the land ownership for the last half mile on the right hand side of the map should be redesignated as Forest Service land rather than private land.

Volume V contains all the letters of comment received on the draft EIR/EIS as well as the transcripts of the public meetings to receive comment. Staff responses to these comments are also provided in Volume V.

1.3.3 Revisions to the Draft EIR/EIS

As a result of the massive number of comments on the draft EIR/EIS, as well as the original size of the draft, a system needed to be developed which would assist the reader as to what staff did with each specific comment and more importantly where precisely staff did make revisions, deletions, etc. Originally an errata volume was developed but this became difficult to work with, particularly for such a large draft EIR/EIS. Ultimately, there was a strong desire by staff to have a final EIR/EIS which could stand alone but in which the reader could easily identify revisions, deletions, and other changes to the document. The following system was developed for the majority of Volumes I and II:

- If wording was deleted, the old wording is presented but crossed out by use of hyphens;
- All inserted wording, whether replacement or totally new, is underlined.

There are some exceptions to the above. Certain sections of the draft EIR/EIS were so extensively modified that they were not underlined. These are the Mitigation Measures sections in both Volume I and II. Where staff could, some of the specific mitigation measures in these sections which were changed can be identified by the above mentioned system. Another exception is that changes to tables were simply made without showing the old numbers. Volume III was also rewritten. Editorial changes also were not underlined/hyphenated.

2.0 DESCRIPTION OF PROPOSED PROJECTS

2.1 INTRODUCTION

This chapter describes the pipeline projects that have been proposed by the Mojave Pipeline Company and the El Dorado Interstate Transmission Company.

The Mojave Pipeline Company proposes to construct, own, and operate a ~~387~~ 383-mile interstate natural gas pipeline extending from receipt points within Arizona to the San Joaquin Valley of California. This project would consist of 16.5 miles of 24-inch O.D. pipeline (Mojave Transfer Line); approximately ~~65~~ 62.5 miles of 30-inch and 260 miles of 36-inch O.D. pipeline (Mojave Mainline) including a dual inlet meter station and one compressor station; a ~~45~~ 44-mile long 26-inch O.D. lateral line (Kern Lateral); and 17 to 24 delivery sales meter stations.

The Mojave Pipeline would receive gas supplies from El Paso Natural Gas Company (El Paso) and/or Transwestern Pipeline Company (Transwestern). El Paso would loop two segments of its existing line in Apache County, Arizona. The proposed case would involve 14.8 miles of 30-inch O.D. pipe, and would deliver 400 MMcfd to the Mojave Pipeline. A second alternative case would involve 211.9 miles of 24-, 30-, and 34-inch O.D. pipe, to deliver the full 600 MMcfd required by the Mojave Pipeline. An additional 8,880 hp of compression would also be installed at the existing stations for the 600 MMcfd scenario.

Although not required in the El Paso proposed case, the 600 MMcfd scenario assumes that up to 200 MMcfd of the total volume would be supplied by Northwest Pipeline Corporation (Northwest) at the Ignacio, Colorado, receipt point. Northwest has stated that 162 miles of 24-inch loop pipeline at seven intervals would be required south of the Muddy Creek Compressor Station at Opal, Wyoming, to Ignacio, Colorado, with an additional 32,000 hp of compression at three separate sites. It should be noted that up to 100 MMcfd could be provided with only 8.1 miles of looping and 19,000 hp at the same locations. The 600 MMcfd Alternatives would eliminate the need for any facilities by Transwestern.

Transwestern proposes to loop 11 segments of its existing line between Pyote, Texas, and Needles, Arizona. Approximately 356 miles of looping with 30-inch O.D. pipe would be completed in order to tie into the Mojave Transfer Line. This expansion would allow Transwestern to deliver 320 MMcfd to the Mojave Pipeline.

El Dorado Interstate Transmission Company proposes to construct, own, and operate a 381-mile interstate pipeline extending from Arizona to the San Joaquin Valley of California for the same purpose as the Mojave Pipeline Company proposal. This project would consist of a North Receipt Lateral, 16.5 miles of 24-inch O.D. pipeline, a 255.7-mile-long, 42-inch O.D. mainline, and two delivery laterals. The East Delivery Lateral would consist of 35.8 miles of 30- and 12.75-inch O.D. pipeline. The West Delivery Lateral, including a spur to Maricopa, California, would consist of 72.5 miles of 30-, 24-, and 8.625-inch O.D. pipeline. The El Dorado Pipeline would receive natural gas from El Paso and Transwestern in the same manner as the Mojave Pipeline project except the volume of gas is 520 MMcfd instead of 600 MMcfd.

In addition to the proposals discussed above, a number of routing alternatives have been identified. These alternatives will be discussed subsequent to their respective main route proposal. The No Action Project Alternative will also be examined and addresses several scenarios from no increase in natural gas use by the EOR/cogeneration industry to industry conversion to natural gas supplied by intrastate systems. A discussion of the intrastate alternatives appears in Section 2.4.3. More discussion follows the Kern River alternatives in Volume II, Section 2.5.

2.1.1 General Discussion of Construction, Maintenance, and Operation

The following general discussion on pipeline construction, maintenance and operation, and environmental and safety controls is being provided in the project description to eliminate repetition of general information common to the various pipeline projects under consideration in this study. Specific information pertinent to a particular pipeline project will be discussed in detail within the appropriate section. The general discussion is intended to familiarize the reader with the many and various phases associated with the construction of a natural gas transmission pipeline. This discussion is not intended to cover the broad spectrum of pipeline construction methods, procedures, and associated regulatory requirements.

2.1.1.1 Preconstruction

The permitting process for an interstate natural gas pipeline project follows certification of the proposal by FERC. The BLM would then issue right-of-way (ROW) grants. Application for construction permits are made to all federal, state and local agencies having regulatory jurisdiction in the areas which the pipeline would traverse. Standard permitting requirements such as detailed engineering drawings, land surveys of the pipeline route, and performance or surety bonding are but a few of the specific requirements to be met as a part of a construction permit.

There are pipeline segments across the mountainous terrain of northern Utah where there are no access roads. In several of these areas, construction of access roads would cause more environmental damage than would pipeline construction. In such areas special construction techniques, such as helicopter supported construction, may be required by land management agencies.

Acquisition of construction access will involve the determination of a) miles of new road and reconstructed roads that will be needed across federal and state lands; b) road maintenance needs, traffic, including horizontal and vertical alignments and surfacing needs.

Acquisition of ROW for the pipeline as well as temporary construction-access easements represent a major portion of the preconstruction activities. Easements/right-of-way (ROW) permits are necessary to cross all Federal and State lands. Where possible these easements/ROWs follow existing designated utility corridors on public lands as established in the particular management plan. Where designated corridors are not sufficient for the pipeline project, appropriate changes in the management plan may be requested. This process can generally, but not always, take place as a part of the certification process.

On private or deeded lands the pipeline company would negotiate with land owners for the required ROW. As a last resort, the certificated pipeline project has the power of eminent domain to resolve ROW or easement procurement issues subject to state law.

To minimize conflicts between construction of the pipeline and the on-going land use, prior notification of owners, tenants, and lessees and users of public lands would take place. Ranchers and farmers would be advised of fence openings, disturbances to range or farmland, improvements, and other range or farmland use-related activities before construction.

2.1.1.2 Construction

The first step in construction of a pipeline is to locate, design, and construct/reconstruct access roads where needed. On federal and state lands, such roads will be constructed/reconstructed to the standards specified by concerned federal and state agencies. The second step in construction of a pipeline is to prepare the ROW. Following an on-ground engineering staked survey line, a construction ROW, generally 100 feet wide, would be cleared and contoured. Above-ground vegetation and obstacles would only be cleared to allow safe and efficient use of construction equipment.

Storage areas required for equipment, pipe, and other materials would be acquired through private permission or temporary use permits from appropriate surface management agencies. All of these storage areas would encompass 10 acres for a total of approximately 160 acres. Should they be located outside of the mile-wide corridor being studied in this report, an additional environmental assessment would be necessary.

When encountered along a ROW, fences would be adequately braced before any opening to the fence is made. Locking gates or appropriate fencing would be installed when construction in the area has been completed. Damage to fences, gates, and cattle guards would be restored to the original condition or replaced. Access and livestock control would be employed during construction to limit impact to the use of the land. If damaged, natural barriers for livestock control would be replaced by adequate measures of equal effectiveness.

Clearing of the ROW would follow accepted industry practices and sound construction guidelines. In areas where timbering is required the trees would be cut in uniform length and stacked along the ROW based on the owners' preferences. Stumpage profile would be as low as possible. Stumps would only be removed when necessitated by pipeline installation. Debris created from preparation of the ROW would be disposed of using approved methods during restoration.

Contouring or blading of a ROW is only done to ensure the safe movement of machinery and ditching equipment along the installation route of the pipeline. In particularly difficult terrain, a nominal 100-foot wide construction ROW may not be sufficient. Further, construction of temporary bridges and/or culverts across creeks and arroyos on the ROW may be required to ensure vehicle safety. Where necessary, road materials would be obtained from appropriate sources, e.g., ROW, commercial sources, or adjacent lands by permission from surface management agencies or private landowners. Grading and cut-and-fill excavation would be performed to minimize effects on natural drainage and slope stability. On steep terrain or in wet areas, where the ROW must be graded at two elevations (two-toning) or where diversion dams must be built to facilitate construction, the areas would be restored upon completion of construction to resemble original conditions. Excavation and grading would be undertaken where necessary to increase stability and decrease the gradient of unstable slopes.

Working areas of up to 200 by 400 feet would be needed on each side of major road, railroad, and river crossings. River crossing points would be selected to reduce disturbance of riverbeds or banks. Major river crossings include the Colorado and the Mojave Rivers on the Mojave Mainline and the Kern River on the Kern Lateral.

A major portion of the work associated with the construction of an underground transmission pipeline is the excavation task. With few exceptions the entire transmission pipeline would be buried in a continuous trench. The process of excavating a trench may vary depending on soils and terrain. Where possible a self-propelled trenching machine would be used for excavation.

The width and depth of a trench vary according to the diameter of the pipe used, the soil type, and the minimum cover requirements of the pipe. Typically, depths range from 60 to 66 inches and vary in width from 42 to 54 inches. When rock or rocky formations are encountered, tractor-mounted mechanical rippers are used for excavation. In areas where mechanical rippers are not practical or insufficient, blasting may be employed. Draglines may also be used. Rock formations along the ROW may necessitate the use of blasting. Strict safety precautions would be adhered to when blasting to clear the ROW. To prevent damage to adjacent structures, power and communication lines, blasting mats (blankets) would be used. Extreme care would be exercised to avoid damage to underground structures, cables, conduits, pipelines, and underground water courses or springs. Adequate notice would be provided to adjacent landowners or tenants in advance to protect property or livestock. All work would be performed in complete compliance with state and local codes or ordinances. Permits required for blasting would be secured before any work is performed. Blasting activity would adhere to all manufacturer's prescribed safety procedures and industry practices.

In areas where there is a need to separate top and subsoils, a two-pass trenching process would be used. The first pass would remove topsoil and the second pass would remove subsoil with soils from each of the excavations being placed in separate banks. This allows for proper restoration of the soil during the backfilling process. Spoil banks would contain gaps to prevent storm runoff water from backing up or flooding.

Mainline Construction

The line of pipe would be strung either prior to or after ditching. Regardless of the sequence, the operation of stringing involves the placement of coated pipe, valves, and fittings from the storage yard along the ROW. Pipe will be loaded onto trucks, transported to the ROW, and unloaded by tractors fitted with side booms. (See Figure 2.1-1 for a typical pipeline spread and construction layout.)

After the joints of pipe are strung along the trench and before the sections of pipe are joined together, individual sections of the pipe are bent to allow for uniform fit of the pipeline with the varying contours of the bottom of the trench. A track-mounted, hydraulic pipe-bending machine can tailor the shape of the pipe to conform to the contours of the terrain. The actual bend is made by a set of clamps, or shoes, that grip the outside surface of the pipe at the point where the bend is to be made. Where multiple or complex bends are required in a section of pipe, that section of the pipeline is fabricated in the factory.

Installation of the pipe, following the bending, commences with swabbing the pipe, lining it up for welding, holding it in position until it is securely joined by welding, completing the welds, and lowering it onto skids or blocks.

One of the most crucial phases of pipeline construction is the welding process. The overall integrity of the pipeline depends on this process. Welding is the mechanical fusing of the individual sections of pipe to form the pipeline. Each weld must exhibit the same structural integrity with respect to strength and ductility. Experienced welders highly proficient in pipeline welding are continually tested to maintain the rigorous qualification for certification of pipeline welding.

Every weld is inspected by quality control personnel to determine the quality of the weld. Radiographic examination is a nondestructive method of inspecting the inner structure of welds and determining or inferring the presence of defects. Contractors specializing in radiographic inspection would be engaged. Defects would be repaired or removed as outlined in API 1104. Governmental regulations require nondestructive testing of all welds in areas such as inside railroad or public road ROWs and in certain other areas. The regulations largely follow industry practice. Radiographic inspections would be performed as outlined in 49 CFR, Part 192 - Transportation of Natural and Other Gas by Pipeline.

Each weld seam must be protected from corrosion. Once field coating or wrapping of the weld (compatible with factory-applied coating methods) is completed, the pipeline is ready to be lowered into the trench. Special side boom tractors spread out along the pipeline simultaneously lift the line and move it over the open trench. The string of pipe is then lowered into the trench. Great care is taken to prevent any damage to the pipe coating during this stage of construction.

After the pipe has been lowered into the ditch, the trench will be backfilled. Backfill would be placed by proven techniques to avoid potential settlement that would leave a surface depression.

The final phase of pipeline construction would involve cleanup and restoration of the ROW. The ROW would be cleaned up by removal and disposal of construction debris and surplus materials. Restoration of the ROW surface would involve smoothing with disc harrows or other equipment, and stabilizing when necessary using earth-filled sacks, rock riprap or other materials, and revegetation.

Markers showing the exact location of the pipeline would be installed at fence crossings and road crossings in order to identify the owner of the pipeline and convey emergency information in accordance with applicable governmental regulations. Special markers providing information and guidance to aerial patrol pilots would also be installed.

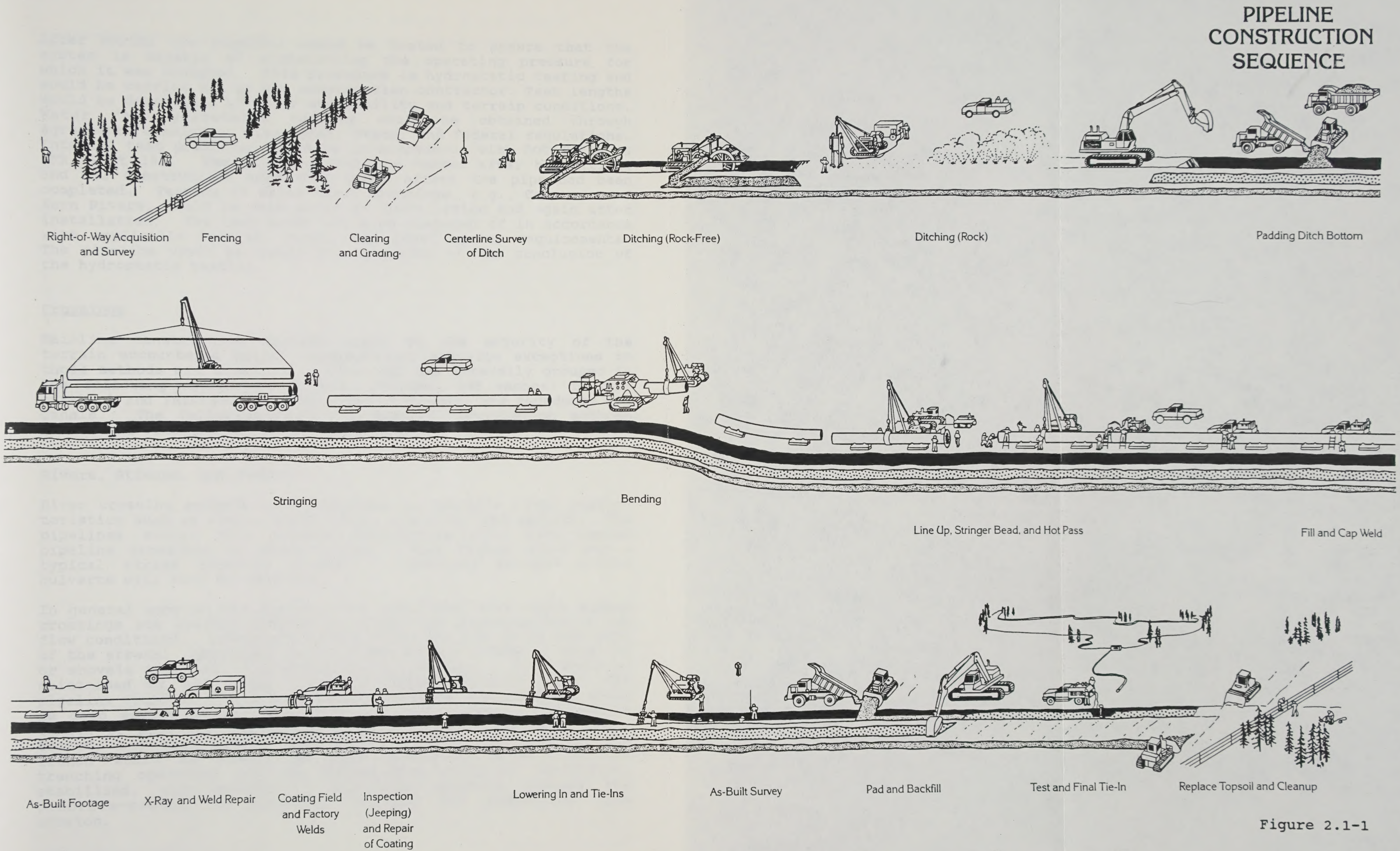

PIPELINE CONSTRUCTION SEQUENCE
Right-of-Way Acquisition and Survey
Fencing
Clearing and Grading
Centerline Survey of Ditch
Ditching (Rock-Free)
Ditching (Rock)
Padding Ditch Bottom
Stringing
Bending
Line Up, Stringer Bead, and Hot Pass
Fill and Cap Weld
As-Built Footage
X-Ray and Weld Repair
Coating Field and Factory Welds
Inspection (Jeeping) and Repair of Coating
Lowering In and Tie-Ins
As-Built Survey
Pad and Backfill
Test and Final Tie-In
Replace Topsoil and Cleanup

Figure 2.1-1

After burial the pipeline would be tested to ensure that the system is capable of withstanding the operating pressure for which it was designed. This procedure is hydrostatic testing and would be carried out by the construction contractor. Test lengths would be determined by water availability and terrain conditions. Water for hydrostatic testing would be obtained through agreements consistent with local, State, and Federal regulations. Internal test pressures would be in accordance with DOT Title 49 CFR, Part 192. The pipeline would be tested after backfilling and all construction work that would affect the pipe had been completed. Testing at major river crossings, e.g., Colorado and Kern Rivers, would be done prior to installation and again after installation. The test water would be disposed of in accordance with applicable federal, state, and local agency requirements. The pipeline would be ready for operation at the conclusion of the hydrostatic testing.

Crossings

Mainline construction methods apply to the majority of the terrain encountered during construction; specific exceptions to those methods are crossings. Crossings are generally grouped in the following categories: rivers, streams, and washes; faults; parallel and intersecting roads, and railroads; and aqueducts and canals. The following describes typical construction methods associated with each of those categories.

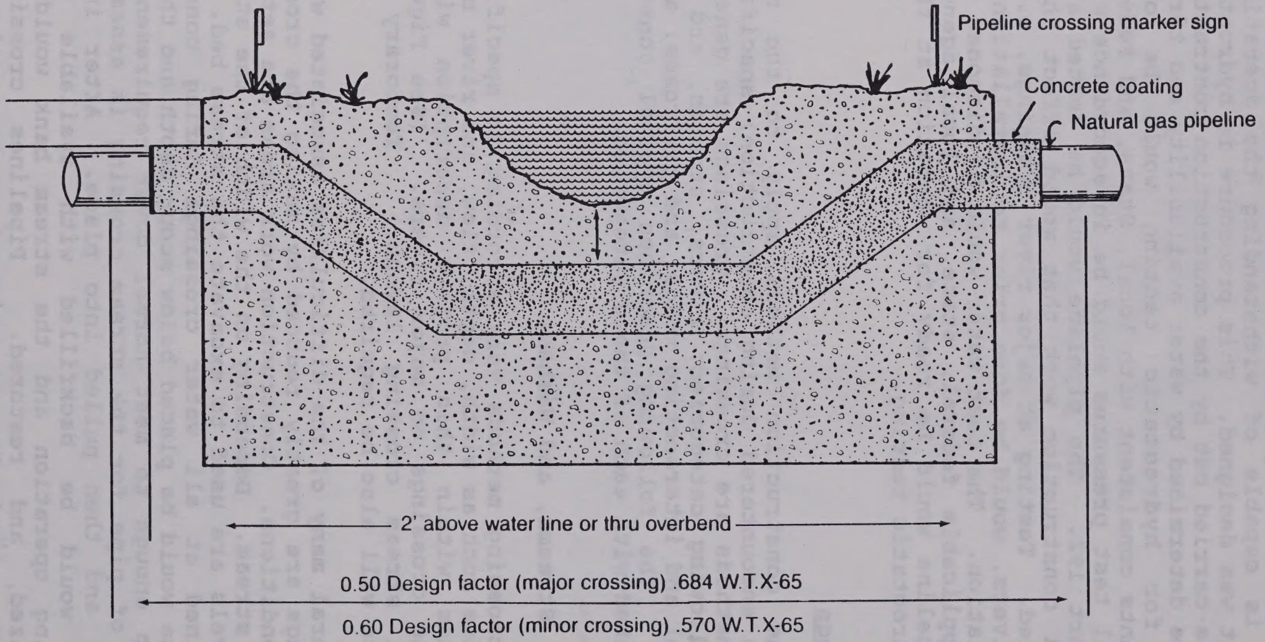
Rivers, Streams, and Washes:

River crossing methods vary according to specific river characteristics such as width, depth, flow, and river bed geology. The pipelines within this project description will have buried pipeline crossings on major rivers. (See Figure 2.1-2 for a typical stream crossing layout.) Temporary bridges and/or culverts will also be required.

In general many of the difficulties associated with major stream crossings are greatly reduced by making the crossing during low flow conditions. Construction work areas are set up on each side of the stream. Depending on the width of the stream, a dragline or shovels are used to excavate the stream bed. Flow would be maintained at all water crossings during construction. The pipeline would be placed below scour depth and the trenches would be deep enough to meet normal cover requirements. The entire length of pipe for the stream crossing is assembled as a unit, tested, and then pulled into place. After installation, the trench would be backfilled with available spoil from the trenching operation and the stream bank would be backfilled, stabilized, and restored. Pipelines crossing streams are concrete-coated for negative buoyancy and protection from erosion.

Figure 2.1-2 Layout of a Typical Stream Crossing

Concrete coating	150 LB /C.F.	190 LB /C.F.
0.60 Design Factor	5 in.	3.5 in.
0.50 Design Factor	4 in.	3.75 in.


Pipeline crossing marker sign
Concrete coating
Natural gas pipeline
2' above water line or thru overbend
0.50 Design factor (major crossing) .684 W.T.X-65
0.60 Design factor (minor crossing) .570 W.T.X-65

Major streams may also be crossed by an aerial crossing in which the pipeline is either suspended by cables or attached to the girders of a bridge. Another method which could be employed involves directional drilling. This technique calls for insertion of the pipe in a bored hole, far below the normal depth of conventional crossings. Crossings at minor streams, gullies, ditches, and washes utilize various methods including dryland construction methods and spanning, with the bare pipe supporting its own weight. Concrete coating or weighting of the pipeline would be employed depending on conditions.

Faults:

Fault-specific studies would be undertaken during the design phase of the certificated project. All Quaternary faults crossed by the proposed facilities would be evaluated to determine their type and degree of activity. The designs of fault crossings would depend on the type of fault, and the likelihood, amount, and potential consequences of expected fault displacement. Three major active fault types occur within the project area: reverse, strike slip, and normal. The most likely design considered for mitigating the effects of fault displacement for these fault types is a pipeline trench widened and deepened sufficiently to accommodate the anticipated fault displacements. The enlarged trench shape would be continued through the zone where the fault displacement could take place. The pipeline within the fault bed is completely suspended in granular bedding material to minimize the resistance of the trench backfill to displacement of the pipeline within. The pipe would be expected to move up the sides of the trench as fault displacement takes place.

If the axial component of the fault displacement is of concern, the axial restraint of the pipe over a few hundred feet on each side of the location of potential displacement could be minimized by use of minimum cover depth and loose granular backfill. Low-friction sleeves around the pipe could also be used.

Finally, for very large amounts of expected fault displacements, an above-ground pipeline supported on horizontal sleepers (slide planes) located perpendicular to the alignment could be designed to accommodate the displacement. The large capacity of this system to accommodate fault displacement stems from the fact that the pipe is not restrained by any soil overburden or lateral backfill restraint and therefore is free to move, restrained only by the friction on the supports.

Road and Railroad Crossings:

When crossing roads with light traffic and where permitted by local authority or owners of private roads, the open cut method would be used. In those instances detours may be required. The boring method would be used to cross all major highway systems and railroads. In the boring method, each side of the crossing is excavated for the boring equipment. Pipe casing sized larger than the carrier pipe is used as a sleeve for the boring auger. Where traffic load factor and soil conditions permit, heavy walled pipe would be used instead of casing the pipe. The cased crossings would have vent pipes, cathodic protection, and would be appropriately marked.

Aqueducts and Canal Crossings:

The construction crossing method used for aqueducts and canals would be determined by the specific circumstances of each crossing. In most cases the boring method would be sufficient. Where required or necessary an aerial suspension system for the pipeline would be employed to make the crossing similar to that discussed for river crossings.

Construction Materials Handling

A major logistics problem associated with the construction of a pipeline is the transportation, stocking and preparation of the pipe before it can be taken into the field for installation. Typically the pipe is manufactured by the factory in lengths up to forty feet. This length is generally the legal maximum length that can be transported by carriers over federal and state highways. The number of pieces that can be carried on a truck depends on the diameter and weight of the pipe. In the case of 36-inch O.D. pipe, up to five segments are carried at a time on the transport truck.

Pipe yards and staging areas are set up to receive and prepare the pipe for shipment to the field. To facilitate the handling and stringing of pipe along the ROW, two pipe sections would be joined (welded) together at the staging area. This longer section of pipe (80 feet) is then strung out along the ROW. The pipe is inspected for damage to the protective coating applied at the factory. If damaged, the coating is repaired.

2.1.1.3 Operation and Maintenance

Operation and maintenance procedures will be developed for the proposed pipeline facilities. Manuals explaining procedures would be developed and made available to all operating personnel.

A thorough program must be outlined to deal with any type of emergency that may occur during the operation of the pipeline. Copies of this plan will be provided to all appropriate Federal and state agencies. Materials must be stored in nearby locations to make quick repairs if a leak occurs. Communications for the proposed pipeline system will be tied in to compressor stations which will be operated on a pressure set point control. The mainline valves would be provided with gas hydraulic operators. Pressure and flow rates would be continuously monitored for dispatching purposes and in order to detect leaks. Block valves will be located according to DOT requirements regarding population density; the wall thickness of the pipe will also vary according to population density. Radio communication and mobile field units will be available among stations to assist in dealing with emergency situations.

Certain operations and maintenance plans and schedules must be implemented to monitor and ensure safe operation. The permanent ROW would be available to ensure reasonable access to facilitate any necessary pipeline maintenance. The pipeline would be inspected regularly using aerial and ground surveys. Instrumented leak surveys would also be performed. All valves and valve actuators would be routinely operated, inspected, and lubricated. Periodic surveys of the cathodic protection system would also be conducted. All pipeline facilities would be marked and identified in accordance with applicable regulations.

2.1.1.4 Environmental and Safety Controls

A number of environmental and safety controls will be implemented by the pipeline companies. The resource considerations outlined below do not include specific mitigation measures.

All activities associated with the project would be conducted in a manner that would avoid or minimize degradation of air, land, and water quality. During construction, operation, maintenance, and termination of the project, the companies would perform all activities in accordance with applicable air and water quality standards and related plans for implementation, including but not limited to standards adopted pursuant to the Clean Air Act as amended (42 USC 7401, et seq.), Clean Water Act, and the Federal Water Pollution Control Act as amended (33 USC 1251, et seq.).

Although no commentors raised the topic of polychlorinated biphenyls (PCBs) in pipelines, concerns have been previously raised in other pipeline projects over the presence of PCBs in portions of existing pipeline systems. Most of these concerns are related to the quantities of PCBs involved, disposal methods used and possible effects on residential customers. There should be little or no concern about PCBs for the proposed projects, as these projects involve the installation of new, uncontaminated pipeline that would transport gas for use in the production of steam into underground oil wells, and not for residential use. Also, the amount of PCBs actually in the gas stream is often undetectable. Quantities of PCBs, if found, are usually discovered in liquid condensate samples taken at low points in the line or at separation facilities along the line.

The use and disposal of PCBs is regulated by the Toxic Substances Control Act of 1976, which is administered by the U.S.

Environmental Protection Agency (EPA). On portions of Transwestern's and El Paso's existing pipeline system that are suspected of being contaminated with PCBs, these two companies, in conjunction with the EPA, routinely sample liquid condensate for the presence of PCBs. In addition, they currently operate liquid diffuser/separators and other liquid collection devices along their systems to remove liquid condensate present in the gas stream.

Liquids collected from potentially contaminated portions of their systems are analyzed for the presence of PCBs. All liquids collected with PCB concentrations equal to or greater than 50 parts per million (ppm) are disposed of in accordance with the EPA's regulations codified at 40 CFR 761.

Although no formal commitments have been made, the staff believes that Mojave, Transwestern, and El Paso, in keeping with normal industry operating procedures, will install and maintain similar liquid collection devices at certain points along the proposed facilities. This would also apply to the Integrated Intrastate System Alternative. The staff believes that the installation and operation of these devices would keep PCB contamination in the new pipeline facilities to a minimum.

Regulatory agency approved herbicides would be used within the fenced area at compressor and meter stations to prevent weed fires, and around safety signs and valve locations within the ROW to maintain visibility, except where it is specifically prohibited by a land management agency (e.g. Nevada BLM).

Where the ROW includes public lands on which cadastral survey monuments and survey markers are located the pipeline companies would avoid disturbance or removal of such monuments or markers. Should it be necessary to remove markers or monuments during construction activities it would be completed in accordance with detailed instructions established by the appropriate agency.

Environmental restoration measures within agricultural areas would include (at a minimum) returning farmland to normal cultivation levels and minimizing the effects on natural drainage. Where terraces or diversion dams must be cut, they would be completely restored and under no circumstances would natural drainage be permanently diverted.

Seeding and mulching of land surfaces so as to quickly produce vegetative cover for erosion control and restore normal conditions would be performed where necessary and appropriate.

Safety concerns during the construction phase of the pipeline would focus on welding inspection. Nondestructive and destructive testing methods are available to welding inspectors for determining the quality of welds. Visual inspection of welds and observation of welding operations by qualified welding inspectors would minimize weld defects and indicate when further examination of certain welds is advisable. Testing of welds is described in Section 2.1.1.2.

A number of safety design factors have been built into the pipeline engineering. For example, they are buried deep enough so that normal plowing for cultivation would not touch the pipe. Heavy wall pipe or casing is used for road and railroad crossings, and corrosion is prevented by cathodic protection systems. The proposed pipelines would conform to the minimum pipeline safety standards set by the U.S. Department of Transportation, which specify minimum pipe wall thickness, strength, and depth of burial for different population densities along the route. Thicker walled pipe would be used at road, major creek, and river crossings. The depth of the buried line would be 30 to 36 inches in normal soil and 18 to 24 inches in consolidated rock. The proposed pipeline would have mainline block valves installed no more than 20 miles apart. If a rupture did occur, it should be noticed immediately by the operating crews at the compressor stations since pipeline pressure would be monitored continuously. If a rupture occurred, the operator on duty would notify the proper personnel and they would be dispatched to carry out necessary emergency procedures.

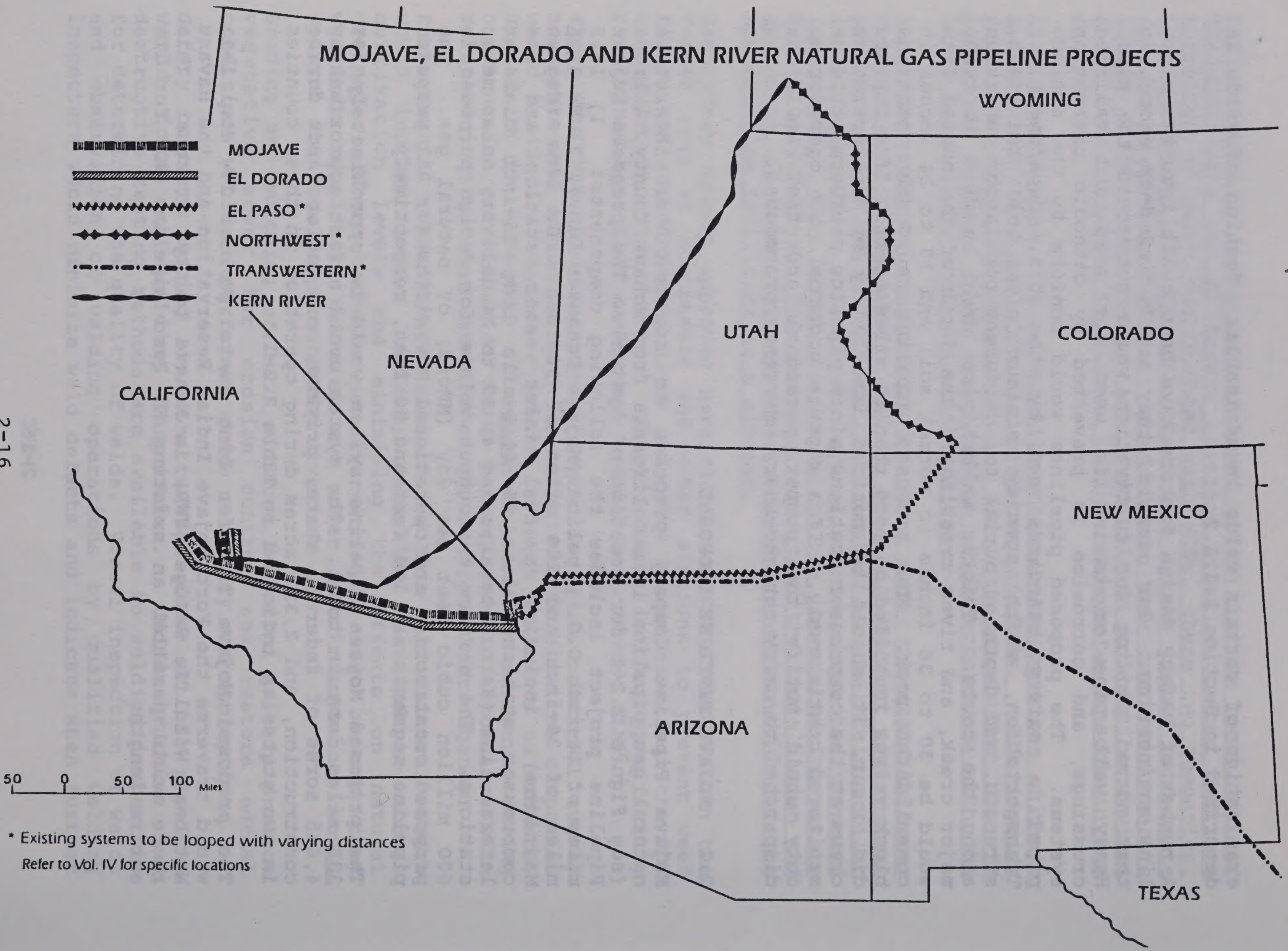
2.2 MOJAVE PIPELINE PROPOSAL

Mojave Pipeline Company proposes to construct an interstate natural gas pipeline into California from Mohave County, Arizona (see Figure 2.2-1 for location of system). The proposed Mojave Pipeline project includes the following components: 1) 16.5 miles of 24-inch O.D. pipeline (Mojave Transfer Line); 2) ~~63~~ 62.5 miles of 30-inch and 260 miles of 36-inch O.D. line (Mojave Mainline), including a dual inlet meter station and one compressor station; 3) a ~~45~~ 44.0-mile long 26-inch diameter lateral line (Kern Lateral); and 4) 17 to 24 delivery sales meter stations. The maximum throughput volume for design purposes is 600 million cubic feet per day (MMcfd) of natural gas. The proposed construction and operational ROW widths for all proposed pipeline segments are 100 feet and 50 feet, respectively.

The proposed Mojave Pipeline system would be approximately ~~387~~ 383 miles long in total. The system could affect approximately 4,645 acres of federal, state, private, and Indian lands during construction, and 2,322 acres during operation in three counties in two states as indicated in Table 2.2-1.

The proposed Mojave Transfer Line route (Volume IV, Map 1-1) would traverse the Fort Mojave Indian Reservation and the Havasu National Wildlife Refuge (NWR) in Mohave County, Arizona. This route would parallel an existing El Paso pipeline ROW for its entire length.

MOJAVE, EL DORADO AND KERN RIVER NATURAL GAS PIPELINE PROJECTS


MOJAVE
EL DORADO
EL PASO *
NORTHWEST *
TRANSWESTERN *
KERN RIVER
WYOMING
UTAH
COLORADO
NEVADA
CALIFORNIA
NEW MEXICO
ARIZONA
TEXAS
50
0
50
100
Miles

* Existing systems to be looped with varying distances
Refer to Vol. IV for specific locations

Figure 2.2-1

Table 2.2-1

GEOGRAPHIC DISTRIBUTION OF FACILITIES, MOJAVE PIPELINE PROPOSAL

State and County	Miles of Pipe	Compression
Arizona		
Mohave	17.75	22,500 hp
California		
San Bernardino	189.75	none
Kern	176.00	none

The proposed Mojave Mainline route (Map 1-2 through 1-8) would traverse the Havasu NWR (MP 0-2.2): the Colorado River (MP 1.1); the northernmost portion of Edwards Air Force Base in Kern County, California (MP 198-211.4); the western boundaries of the Elk Hills Naval Petroleum Reserve (MP 296.5-307.5); and the California and Los Angeles Aqueducts (MP 276.5 and 221.5 respectively) in Kern County, California. The majority of the Mojave Mainline in California would be within BLM designated utility corridors in the California Desert Conservation Area or parallel to other existing and proposed pipeline ROWs (Pacific Gas and Electric [PG&E], Pacific Lighting, and All American). The proposed Mojave Mainline would follow BLM designated utility corridor H from near Topock at the Arizona/California border (MP 1.25) to near Pisgah (MP 123) in San Bernardino County, California. The BLM's designated utility corridor H follows two existing PG&E 34-inch natural gas lines over its entire length. The proposed route would deviate from the BLM's designated utility corridor G west of Pisgah (MP 123) to near Boron (MP 191) in Kern County, California. This route would avoid various towns and subdivisions traversed by corridor G in the area around Daggett, Barstow, and Boron. The proposed Mojave Mainline would generally follow the BLM designated utility corridor G/All American Pipeline route from near Boron (MP 191) to the area south of Tehachapi in Kern County, California (approximately MP 230). It would then continue west across the southern Cummings Valley, the Tejon Ranch, and the San Joaquin Valley to the vicinity of Maricopa. The proposed Mojave Mainline route then turns northwest intermittently paralleling existing Pacific Lighting pipelines over short distances in western Kern County.

The proposed Kern Lateral route (Map 1-9 and 1-10) would leave the Mojave Mainline near the western boundary of Tejon Ranch and heads north skirting the base of the hills. After crossing Highway 58 it would turn to the northwest, traverse the Kern River northeast of Bakersfield, and end near Highway 65, in Kern County, California.

2.2.1 Facilities

The following project components will be associated with the construction, operation, and maintenance of the proposed pipeline project:

- o Approximately 16.5 miles of 24-inch diameter buried pipeline (Mojave Transfer Line) would be constructed from a tap point on an existing 30-inch Transwestern pipeline to the proposed compressor station MJ-1 near Topock in Mohave County, Arizona. The Mojave Transfer Line will have the following specifications: 24-inch O.D., 0.259-inch wall thickness API-5L X60 ERW grade line pipe with a Maximum Allowable Operating Pressure (MAOP) of 1010 psig, with a maximum operating temperature of 130^{o} F, and a maximum design flow rate of 600 MMcfd.

- o Approximately 260 miles of 36-inch diameter buried pipeline (Mojave Mainline) would be constructed from proposed compressor station MJ-1 near Topock, Arizona, to the Bakersfield area in Kern County, California. This portion of the Mojave Mainline will have the following specifications: 36-inch O.D., 0.375 inch wall thickness API-5L X65 ERW grade line pipe with a MAOP of 975 psig, with a maximum operating temperature of 130^{o} F, and a maximum design flow rate of 600 MMcfd.

- o Approximately ~~63~~ 62.5 miles of 30-inch diameter buried pipeline (Mojave Mainline) would extend from the juncture of the Kern Lateral and the Mojave Mainline. This portion on the mainline would have the following specifications: 30-inch O.D., 0.313 inch wall thickness API-5L X65 ERW grade line pipe with a MAOP of 975 psig, with a maximum operating temperature of 130^{o} F, and a maximum design flow rate of 500 MMcfd.

- o Approximately ~~45~~ 44 miles of 26-inch diameter buried lateral pipeline (Kern Lateral) would be constructed in Kern County, California. The Kern Lateral will have the following design specifications: 26-inch O.D., 0.271-inch wall thickness API-5L X60 grade line pipe with a MAOP of 975 psig, with a maximum operating temperature of 130^{o} F, and a maximum design flow rate of 100 MMcfd. The remaining 500 MMcfd would continue to the mainline terminus.

- o Construction of one 22,500 hp natural gas-powered compressor station for the Mojave Mainline at Topock, Arizona. Approximately 20 acres would be required for the compressor station within an existing El Paso 40-acre site. Communications from this new compressor station would be by means of a microwave system. Electrical power will probably be supplied by the local electrical power supply company and would be backed up by an on-site natural gas-powered generator. The location of the proposed compressor station is T16N, R21W, SE1/4 SE1/4 of

Section 35 (Map 1). (See Figure 2.2-2 for a compressor station layout.)

- A dual inlet meter station at the MJ-1 compressor station at Topock, Arizona, 17 to 24 delivery meter stations in the San Joaquin Valley, and an unspecified number of valve sites (block, flow control, relief, and regulating) would be constructed as part of the proposed pipeline project. Block valve sites will be approximately 20 by 30 feet. Vent pipes would be installed at cased road and railroad crossings.

- Cathodic protection units consisting of rectifiers and ground bed anodes would be installed along the ROW to minimize corrosion of pipe. These measures would be in addition to protective piping coating. The exact number and locations of the cathodic units would be determined during construction, based on field surveys to determine unit sizes, minimum pipe-to-soil potential requirements, and minimum interference with other systems. These units would be located as close as possible to existing power sources. Rectifiers would be enclosed in metal containers (approximately 18x18x32 inches in size) attached to an H-frame support or a pole. Service wires would be installed either overhead or buried from the nearest source of electricity. Corrosion control test stations would be installed to monitor the cathodic protection system. At present, no specific locations of these facilities have been provided by the applicant.

- Markers would be installed along the ROW in the size, color, type, location, and number required by DOT regulations.

Existing roads or the ROW itself would be used for surface travel wherever possible. At this time, Mojave does not anticipate construction of any significant new access roads. If required, new access road construction outside of the one-mile wide corridor established for environmental review would require additional data collection outside of the scope of the EIR/EIS. Existing access roads would be utilized for construction of the proposed compressor station near Topock, Arizona. Improvements of some existing roads may be necessary for access to other surface facility sites during operation. Use or construction of any roads across public lands would require a ROW easement from the appropriate governmental body. Table 2.2-2 lists the proposed location of the communication sites for the Mojave project. All of these microwave relay towers lie within the one-mile wide analysis corridor but have not been specifically identified by the applicants.

Figure 2.2-2 Compressor Station Layout; Mojave Proposal

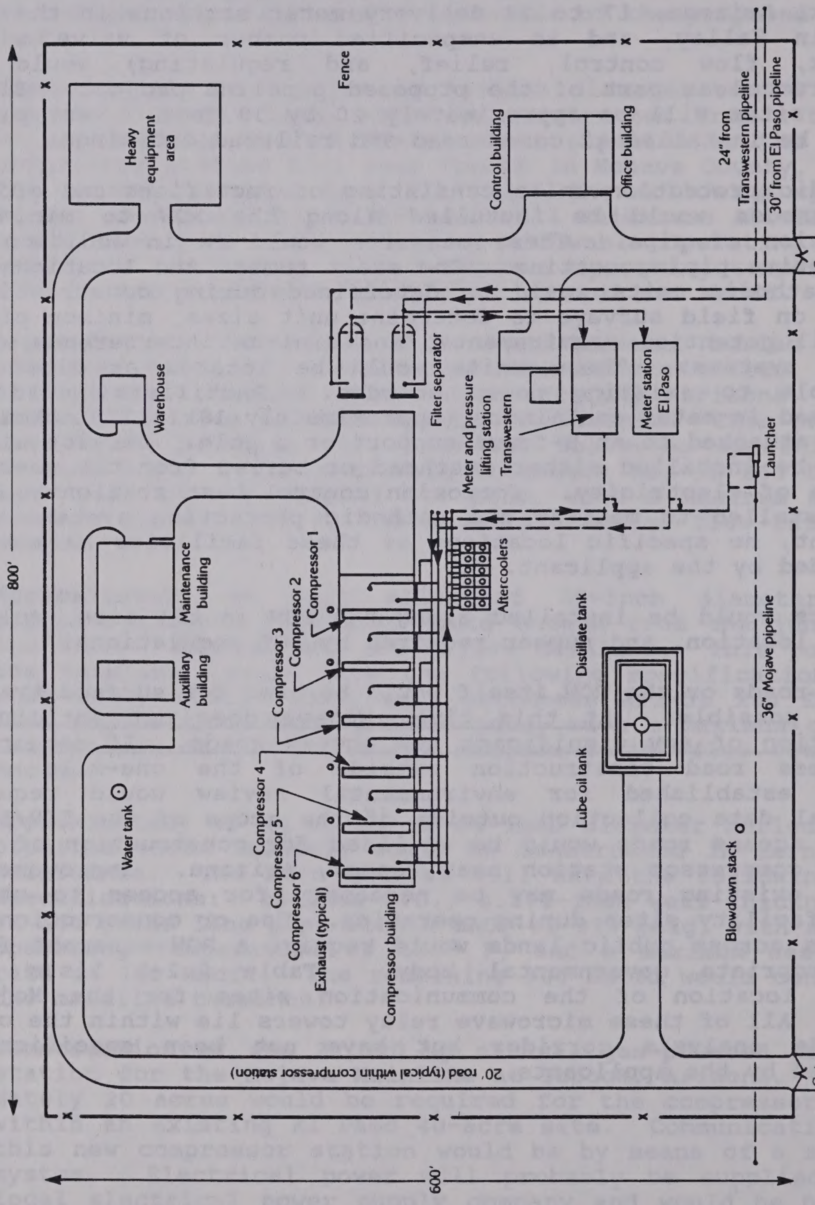

800'
600'
Heavy equipment area
Fence
Control building
Office building
24" from Transwestern pipeline
30" from El Paso pipeline
Gate
24' access road
Warehouse
Filter separator
Meter and pressure lifting station Transwestern
Meter station El Paso
Launcher
Maintenance building
Compressor 1
Compressor 2
Compressor 3
Aftercoolers
Distillate tank
36" Mojave pipeline
Auxilliary building
Compressor 4
Compressor 5
Compressor 6
Exhaust (typical)
Water tank
Lube oil tank
Blowdown stack
Compressor building
24' access road
Gate
20' road (typical within compressor station)

Table 2.2-2

PRELIMINARY MICROWAVE SITE LOCATIONS, MOJAVE PIPELINE PROPOSAL

Number	Milepost	Pipeline Segment
1	0	Mainline
2	40	Mainline
3	60	Mainline
4	80	Mainline
5	95	Mainline
6	110	Mainline
7	130	Mainline
8	150	Mainline
9	169	Mainline
10	190	Mainline
11	210	Mainline
12	230	Mainline
13	250	Mainline
14	290	Mainline
15	310	Mainline
16	20	Kern Lateral
17	Headquarters at Bakersfield	

2.2.2 Construction, Operation, and Maintenance

2.2.2.1 Preconstruction Activities

Mojave Pipeline Company will survey the proposed line prior to initiating construction related activities and would then either purchase or secure ROW easements from private landowners whose property would intersect the pipeline route. Owners, tenants, and lessees of private land, and lessees and users of public lands in the ROW would be notified prior to construction activities and suitable arrangements would be made to lessen impacts.

2.2.2.2 Pipeline Construction Methods

Following pipeline system design and after ROW easements, grants, and all required clearances have been obtained, construction would begin. Construction of the proposed Mojave Pipeline project would be performed simultaneously by several different contractors.

Construction activities would normally be confined to a 50-foot permanent ROW and a 50-foot temporary use space for construction along the proposed route. Typical construction activities would require clearing above-ground vegetation and obstacles to allow safe and efficient operation of the construction equipment. This clearing would normally take place only within the 100-foot construction ROW. In clearing the ROW contractors would follow accepted industry practices.

The proposed Mojave Mainline would cross the Colorado River suspended on the Highway 66 bridge. The typical construction technique for river crossing therefore would not apply for the Colorado River crossing.

2.2.2.3 Construction Workforce and Schedule

The ~~387~~ 383 miles of proposed pipeline would be constructed simultaneously by separate construction crews. One contractor would be selected to construct the Mojave Transfer Line; two would be chosen to construct the Mojave Mainline, one for the eastern section (MP 0 to 167) and one for the western section (MP 167 to 325). A fourth contractor would be selected to construct the Kern Lateral. One contractor would be selected to construct the compressor station on the mainline and one or more contractors would be selected to construct the meter stations.

The entire system would be constructed within approximately ten months, with construction along any one location along the route to be completed within six to ten weeks from initial land disturbance to the end of restoration. The length of open trench would vary between five to ten miles; however, the trench would only be open a few days at any given locality dependent on weather conditions, construction location, and environmental restrictions. Approximately 50 to 170 vehicles will be in operation along the construction ROW depending on the stage on construction.

The maximum number of construction workers associated directly with pipeline construction is estimated by the applicant at about 1,700. Spread crew sizes would vary from 200 to 375 for each activity. The spread crews would require about 55 to 65 percent skilled workers (nonlocal) and 35 to 45 percent unskilled workers (local).

Each of the pipeline sections would be constructed by contractors under Mojave Pipeline Company's supervision. It is likely that construction workers would seek temporary housing and related services in the cities and towns present along the routes. Pipeline construction is expected to require 10 months once all necessary permits and clearances are obtained and final design is completed.

It is estimated by the Mojave Pipeline Company that an operating and maintenance staff of 80 to 123 additional permanent employees would be required to operate and maintain the proposed pipeline system.

2.2.3 Environmental and Safety Controls

Primary environmental and safety controls for the proposed line would follow the procedures outlined in the general discussion of environmental controls in Section 2.1.1.4. Mojave has developed sediment and erosion control guidelines as well as revegetation plans which would be followed where necessary. These documents are on file with both the SLC and FERC.

The precise location of valves has not been provided by the applicant at this time; however, valves would be installed at intervals of 8 to 20 miles. As indicated above, a regularly scheduled program of field inspections and maintenance would be implemented, which would provide a significant level of environmental and safety control.

2.2.4 Future Plans and Abandonment

No plans beyond the useful life of the proposed Mojave Pipeline have been put forth. The estimated useful life of the proposed pipeline is 30 to 40 years. Upon cessation of operation, an abandonment plan will be assessed at the time of use termination. The compressor station and other ancillary surface facilities would be dismantled. Equipment would be salvaged or reused to the extent possible. The compressor station foundation would be broken up, refuse would be hauled to approved disposal sites, and the sites would be revegetated and restored in accordance with applicable agency regulations in effect at that time.

2.3 MOJAVE ROUTE ALTERNATIVES

2.3.1 Mojave Pipeline Alternative A

Alternative A (Map 1-11 and 1-12) is an alternative to the proposed Mojave Transfer Line. It is approximately 23 miles long, about 6.5 miles longer than the proposed Mojave Transfer Line. Alternative A follows the BLM Davis-Parker (Route A) utility corridor which is an existing 230 Kv transmission line and the BLM Interstate 40 utility corridor along an existing El Paso ROW, in Mohave County, Arizona. The proposed Mojave Transfer Line parallels proposed and existing El Paso pipeline ROWs which traverse the Havasu National Wildlife Refuge (NWR). The primary advantage of Alternative A is the avoidance of the Havasu NWR. The 24-inch diameter pipeline would begin at a tap point on the same existing 30-inch Transwestern pipeline four miles east of the proposed Mojave Transfer Line and end at the proposed compressor station MJ-1 near Topock in Mohave County, Arizona.

2.3.2 Mojave Pipeline Alternative B

Alternative B (Map 1-13 and 1-14) follows BLM designated utility planning corridor G/All American Pipeline ROW within the California Desert Conservation Area (CDCA) between Pisgah and Boron. This alternative is the same length (approximately 76 miles) as the corresponding portion of the proposed route. Alternative B departs from the proposed Mojave Mainline route at about MP 115 and ties back in at about MP 191. Although Alternative B follows BLM-designated utility planning corridor G in the CDCA, it traverses various towns and subdivisions such as Daggett, Barstow, and Boron that the proposed route avoids.

2.4 MOJAVE SYSTEM ALTERNATIVES

2.4.1 Kern River Proposal and Alternatives to Kern River

(see Volume II)

2.4.2 El Dorado

(see Section 2.5)

2.4.3 Integrated Intrastate System

~~Both Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal) have presented flow diagrams indicating that under existing contract capacity they have the capability of supplying at least 600 MMcfd from the California/Arizona border to the EOR market as an integrated intrastate system with no additional facility requirements. If El Paso and Transwestern were able to supply EOR volumes from current capacity allocations for PG&E and SoCal (as originally proposed by El Paso), it would suggest that fewer facilities would be needed on the El Paso or Transwestern systems than currently proposed. However, it is assumed that El Paso will be transporting additional Canadian and/or Rocky Mountain gas. The gas would first be transported by Northwest's pipeline system to El Paso's delivery point at Ignacio, Colorado. The facilities necessary to transport up to 200 MMcfd by Northwest are discussed under the El Paso main proposal. They may require up to 163 miles of looping. If up to 200 MMcfd comes from Ignacio for delivery to the integrated intrastate system, 45 miles of pipeline looping would be required between Ignacio and Valve City, New Mexico. These would involve the Blanco, Chaco, White Rock, and Gallup Loops and the Bondad compressor station addition (7,160 hp) as identified in El Paso's main proposal. An interconnecting lateral similar to the Mojave Transfer Line would also be needed. In addition, the FERC staff has included the construction of a new 17,000 hp centrifugal compressor station on PG&E's system at Danby, California, at a cost of $17 million.~~

The Integrated Interstate System Alternative would use spare capacity on both the Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal) systems to deliver at least 600 MMcfd from the California/Arizona border to the EOR market. If these systems are operated in an integrated fashion, flow diagrams provided by these companies indicate that they can supply up to about 690 MMcfd from existing capacity and existing authorized deliveries from El Paso and Transwestern through 1994-1995.

While it appears that this scenario could function with no additional facilities at all, the staff has assumed the addition of a connector pipeline similar to the Mojave Transfer Line. This would ensure complete flexibility for the Integrated Intrastate System to receive gas from either Transwestern or El Paso at either of the delivery points. The staff was not totally convinced that the system could operate in a fully integrated fashion without this interconnection since the first connection between PG&E and SoCal is currently about 90 miles into California. Therefore, the total facility requirement assumed for the Integrated Interstate System Alternative is the 16.5 mile-long Mojave Transfer Line.

2.5 EL DORADO PIPELINE ~~PROPOSAL~~ ALTERNATIVE [1]

El Dorado Interstate Transmission Company (El Dorado) proposed to construct, own, and operate a 381 mile interstate natural gas pipeline extending from receipt points within Arizona and California to delivery points near Bakersfield, California (Figure 2.2-1 and in Volume IV, Map 2). This pipeline is for the purpose of transporting natural gas for use by oil companies engaged in enhanced oil recovery (EOR) and/or cogeneration projects in the San Joaquin Valley in central California.

The ~~proposed~~ pipeline system would consist of a North Receipt Lateral, a mainline section, and two delivery lateral sections. The North Receipt Lateral section of the pipeline (Map 2-1) would consist of 16.5 miles of 24-inch O.D. pipeline extending from a proposed interconnection with the pipeline owned by Transwestern Pipeline Company (Transwestern), south to a meter station near Topock, Arizona.

The mainline section of the pipeline would consist of 255.7 miles of 42-inch O.D. pipeline (Map 2-2 through 2-7) extending from a meter station which interconnects with the El Paso pipeline near Topock, Arizona. It would continue west across the Colorado River to a point approximately four miles south of Arvin, California, in the San Joaquin Valley. The mainline would divide at this point into two delivery laterals: the East Delivery Lateral and the West Delivery Lateral. The East Delivery Lateral (Map 2-10) would consist of 26.4 miles of 30-inch O.D. pipeline and 9.4 miles of 12.75-inch O.D. pipeline extending from the mainline northwest to a minimum of five delivery points near the Kern Front Oil Field north of Bakersfield. The West Delivery Lateral (Map 2-7 through 2-9) would consist of 47.7 miles of 30-inch O.D. pipeline, including 3.9 miles of 8.625-inch O.D. pipeline to an area near Maricopa, California, and 20.9 miles of 24-inch O.D. pipeline extending from the mainline west across the California Aqueduct and State Highway 33 to a minimum of six delivery points in the South Belridge Oil Field and Kern Ridge areas. Since the mileposts do not change as do those of the East Delivery Lateral the West Delivery Lateral will be examined as a part of the mainline.

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[1] See footnote on page 1-2. El Dorado is no longer a competitive applicant but is viewed by staff as an alternative route (versus applicant) to Mojave.

The proposed lines would impact three counties in two states as indicated in Table 2.5-1. The project would directly affect a total of 4,565 acres of land during construction and 2,282 during operation.

Table 2.5-1

GEOGRAPHIC DISTRIBUTION OF FACILITIES
FOR THE EL DORADO PROPOSAL

State and County	Miles of Pipe	Compression
Arizona		
Mohave	17.75	none
California		
San Bernardino	184.0	none
Kern	174.8	none

The North Receipt Lateral would begin at a proposed tie-in point on an existing 30-inch diameter pipeline owned by Transwestern approximately five miles east of the Colorado River. The North Receipt Lateral would proceed south paralleling an existing El Paso pipeline ROW. To the west, the route parallels the Mohave Valley and Topock Marsh and passes near portions of the Fort Mojave Indian Reservation. The route would pass through the boundaries of the Havasu National Wildlife Refuge (NWR). The route then crosses Highway 95 and leaves the existing El Paso pipeline ROW alignment to parallel Highway 95 for two miles to avoid an existing subdivision (Golden Shores). The highway is crossed again and the route would again parallel the existing El Paso ROW. The route then passes through the Havasu NWR again and crosses the Atchison, Topeka and Santa Fe Railroad. The proposed pipeline route continues south to the existing El Paso meter station located approximately one mile northeast of Topock. The

North Receipt Lateral pipeline would be approximately 16.5 miles long.

The proposed mainline route would begin at the existing El Paso meter station and ~~proceed west across~~ cross the Colorado River on the top of one side of the old U.S. Highway 66 bridge near PG&E's Topock Compressor Station. The mainline route would continue west, paralleling the PG&E pipeline ROW through southern California desert terrain.

The proposed route would leave the PG&E ROW and follow the SoCal ROW from the east edge of Fenner Valley to a point 12 miles northwest of Ludlow, California. This section of the proposed route would pass south of the Clipper Mountains, north of the Marble Mountains, through the Bristol Mountains, and south of the Cady Mountains.

The primary mainline route would follow the PG&E ROW to a point near the Daggett exit on Interstate 40 where it would join the Cal Nev Pipeline Company pipeline alignment. The route would follow the Cal Nev alignment which passes south of Barstow, California, to a point approximately one mile east of Interstate 15. At this point, the route leaves the Cal Nev pipeline ROW and continues west across Interstate 15 for approximately three miles, then turns northwest across the AT&SF Railroad and the Mojave River to join the PG&E pipeline ROW near Highway 58. The proposed route would then follow the southern PG&E ROW across Highway 395 near Kramer Junction and pass south of Boron and across the northern edge of Edwards Air Force Base. The route would continue west along the PG&E ROW passing south of Mojave, crossing the AT&SF Railroad, Highway 14, the Southern Pacific Railroad, and the Los Angeles Aqueduct. The PG&E alignment would then be followed from the floor of the Mojave Desert in the Tehachapi Mountains passing south of the town of Tehachapi to a point six miles west of town.

The primary route would leave the PG&E alignment and would follow the southern edge of the ridge separating Bear Valley and Cummings Valley for approximately seven miles before rejoining the PG&E alignment on the ridge south of Little Sycamore Canyon. The proposed route would then follow the PG&E alignment down to the floor of the San Joaquin Valley terminating at a point four miles southeast of Arvin. This point is the beginning of the East and West Delivery Laterals at MP 256.

The proposed West Delivery Lateral route to Kern Ridge would begin at mainline MP 256 and proceed west along Sandrini Road for 10 miles, crossing several existing irrigation pipelines, canals, and county roads. The proposed route would continue west, crossing State Highway 99 and Interstate 5 for 22 miles. The route would then cross the California Aqueduct and State Highway 33 and enter a large oil field area one mile south of Taft. It would then turn northeast, more or less parallel State Highway

33, and reach the South Belridge Oil Field where the proposed route would terminate in the Kern Ridge area.

At MP 290, three miles southeast of Taft, California, a service branch from the West Delivery Lateral would extend south for four miles to a terminus point near the town of Maricopa, California.

The proposed East Delivery Lateral would begin near the intersection of Herring Road and Tower Line Road, four miles southeast of Arvin. The proposed route would then proceed north along Tower Line Road for nine miles. The route would then turn northwest through the Edison Oil Field and north along Edison Drive to a point north of Highway 58. The proposed route would again turn northwest passing on the west side of Kern Bluff Oil Field after crossing State Highways 184 and 78. The proposed route would then turn west, crossing the Alfred Harrel Highway, the Kern River, and parallel the north edge of Round Mountain Road for one mile. It would then turn north and continue through the Kern River and Kern Front Oil Fields, cross Poso Creek, and terminate near the Shell Kern River site, 35.8 miles from the mainline.

2.5.1 Facilities

El Dorado proposes to construct, own, and operate a dual inlet meter station at the proposed interconnection of the North Receipt Lateral and El Paso's 30-inch pipeline near Topock, Arizona. A minimum of 11 other meter stations would be constructed, one at each of the delivery points on the East and West Delivery Laterals. Each meter station would consist of meter runs, an instrument building with flow computers, and a data acquisition system. Meter runs would be equipped with pressure and temperature transmitters which would transmit data to a microprocessor which would compute the gas flow volumes. Flow and pressure data would then be transmitted to the operations center via a data acquisition and communications system. Sizing and location of the meter stations would be determined when the pressure and required gas quantities at each location are finalized.

A pipeline operation center is proposed to be established near Bakersfield to allow operating personnel to monitor operation of the pipeline. The operations center would consist of a control room, offices, sanitary facilities, and a maintenance shop.

One maintenance base is proposed for locating spare parts, emergency stock, and tools and equipment as required for the maintenance and operation of the pipeline system. The base would be located near MP 100, north of Ludlow.

Communication system facilities are proposed for fully self-sufficient operation of the pipeline system with base stations at

MP 0, at MP 100, at the delivery point meter stations, and at the operations center near Bakersfield.

The pipeline cathodic protection system would consist of rectifiers or anode beds, and test stations. The initial installation would provide for the expected requirements based on a preliminary survey. Following installation, the pipe-to-soil potential would be monitored at the test stations and additional rectifiers and anodes installed as required to maintain adequate protection.

The proposed pipeline facilities would be designed in accordance with Subparts C (pipe design) and D (design of pipeline components), U.S. Department of Transportation Pipeline Safety Standards, 49 CFR, Part 192.

The total combined length of the proposed pipeline system is approximately 381 miles, with the entire system designed for a maximum operating temperature of 130° F.

The North Receipt Lateral would consist of approximately 16.5 miles of 24-inch diameter, 0.281-inch wall thickness, API-5L grade X65 double submerged arc welded (DSAW) pipe. The inlet pressure at the tie-in to Transwestern's pipeline would be 850 psig with an inlet gas temperature of 100° F. The MAOP would be 1095 psig for the North Receipt Lateral.

The mainline would consist of approximately 255.7 miles of 42-inch diameter, 0.469-inch wall thickness, API-5L grade X65 DSAW pipe. The inlet pressure would be at least 600 psig with an inlet gas temperature of 100° to 130° F. The MAOP would be 1045 psig with a maximum design flow rate of 520 MMcfd.

The West Delivery Lateral would consist of three pipeline sections: 1) approximately 47.7 miles of 30-inch diameter, 0.344-inch wall thickness, API-5L grade X65 DSAW pipe with a MAOP of 1073 psig; 2) approximately 20.9 miles of 24-inch diameter, 0.281-inch wall thickness, API-5L X65 DSAW pipe with a MAOP of 1095 psig; and 3) approximately 3.9 miles of 8.625-inch diameter, 0.188-inch wall thickness, API-5L grade X52 ERW pipe for the lateral to Maricopa with a MAOP of 1632 psig.

The East Delivery Lateral would consist of two pipeline segments: approximately 26.4 miles of 30-inch diameter, 0.344-inch wall thickness, API-5L grade X65 DSAW with a MAOP of 1073 psig; and approximately 9.4 miles of 12.75-inch diameter, 0.219-inch wall thickness, API-5L grade X52 electric resistance welded (ERW) with a MAOP of 1286 psig.

Since the proposed route passes through areas with low population density, mainline block valves would be installed every 20 miles. Additional valves would be installed on both sides of the Colorado River and as required in populated areas. The block valves would conform to the requirements of API 6D and consist of full opening gate valves with manual or gas powered operators. The gate valves would have blowdown stacks upstream and downstream interconnected with a bypass line.

2.5.2 Construction, Operation, and Maintenance

2.5.2.1 Pre-construction Activities

Prior to pipeline construction, it would be necessary for El Dorado to continue to perform research into ownership of properties that would be traversed. Right of entry would be acquired from private landowners, tenants would be notified, and the pipeline alignment would be surveyed. (See also Section 2.1.1.1 for an expanded discussion of pre-construction activities.)

ROW acquisition would include negotiations with each private landowner. ROW restrictions would be compiled and included in the construction specifications.

Material storage sites would be acquired at strategic locations along the route where pipe and materials would be stockpiled. Temporary offices for right-of-way agents would also be located along the pipeline route.

2.5.2.2 Pipeline Construction Methods

Following pipeline system design and after ROW easements, grants, and all required clearances have been obtained, construction would begin. Construction of the proposed El Dorado Pipeline project would be performed simultaneously by several different contractors. (See also Section 2.1.1.2 for an expanded discussion of pipeline construction methods.)

2.5.2.3 Construction Workforce and Schedule

It is anticipated by El Dorado that mainline and lateral pipeline construction would be done with three spreads of equipment working simultaneously. The maximum number of construction workers per spread is 410, approximately 40 percent of which would be unskilled and would come from the local workforce. Most of the construction crew would use accommodations along the proposed route. Each phase of construction would follow closely behind the preceding phase. Due to this tight scheduling control, the duration of the pipeline and metering facilities construction is expected to be approximately seven months.

2.5.3 Environmental and Safety Controls

A general discussion of environmental controls is in Section 2.1.1.4. In addition to anti-corrosion coatings outside the pipe, cathodic protection will be applied to the pipe to minimize corrosion and prevent a pipeline failure. If a pipe segment becomes exposed because of repair or maintenance, it would be visually checked for corrosion.

The pipeline would be clearly marked at line-of-sight intervals and at crossings of public roads, railroads, and other key points. The pipeline would also be patrolled in accordance with 49 CFR 192.

El Dorado will prepare a written procedure to minimize the hazard resulting from a pipeline emergency. This written plan will be provided to all appropriate Federal and state agencies. Included in this procedure will be:

1. Instructions for receiving, identifying, and classifying events that require immediate attention.
2. Instructions for establishing a liaison with appropriate governmental agencies.
3. Telephone lists of personnel, public agencies, and other utilty companies in the district.
4. Lists and locations of emergency tools and equipment including available rental equipment.
5. Procedures and instructions for news releases during an emergency.
6. List of physicians, ambulances, and hospitals.
7. Instructions for prompt and effective response to emergency or potentially hazardous situations.

El Dorado has developed a mitigation plan which would cover items such as sediment and erosion control guidelines and plans for revegetation. These plans have been filed with both the SLC and FERC and El Dorado has stated that these mitigation procedures would be followed where applicable.

2.5.4 Future Plans and Abandonment

In the event of an increased demand for gas (above 520 MMcfd), the proposed expansion plan would be to install a gas turbine-driven centrifugal compressor station on the Arizona side of the Colorado River at MP 0. This compressor station could increase the throughput of the system to approximately 1100 MMcfd. The system capacity could be further increased to 1200 MMcfd by installing a second compressor station at MP 100.

Additional delivery points off the East and West Delivery Laterals would also be possible by adding short pipeline sections to connect to the delivery laterals.

At the end of the useful life of the pipeline systems, approximately 30 to 40 years, the pipeline would be abandoned in accordance with the regulations of the U.S. Department of Transportation and various other state and federal codes. An abandonment plan will be assessed at the time of use termination.

2.6 EL DORADO ROUTE ALTERNATIVES

2.6.1 El Dorado Alternative A

Alternative A (Maps 2-11 and 2-12) would depart from the proposed mainline route at approximately MP 37. This route would follow the PG&E alignment southwest through the Fenner Valley near Highway 66. It bends to the west at Chambless, then parallels Highway 66 to Amboy and turns northwest rejoining the primary route at MP 110. This alternative route is approximately 75.4 miles long, 2.4 miles longer than the proposed route, and is similar to the Mojave Mainline route.

2.6.2 El Dorado Alternative B

Alternative B (Map 2-13) would depart from the proposed mainline route at approximately MP 240, following the PG&E alignment through Bear Valley west from the town of Tehachapi to a terminus point at MP 250. This alternative route is approximately 8.3 miles long, almost two miles shorter than the proposed route. The Bear Valley land development would be crossed with this alignment.

2.6.3 El Dorado Alternative C

Alternative C (Map 2-13) would depart from the proposed mainline route at approximately MP 247 at the western end of the Cummings Valley. It would traverse mountain valleys and ridges west of Cummings Valley and descend the Tehachapi Mountains along a long ridge to join the San Joaquin Valley floor north of Comanche Pint rejoining the proposed Mainline at MP 256. Alternative C would be approximately 5.6 miles long, approximately 3.3 miles shorter than the proposed route.

2.7 EL DORADO SYSTEM ALTERNATIVES

2.7.1 Kern River Proposal and Alternatives to Kern River

(see Volume II)

2.7.2 Integrated Intrastate System

(see Section 2.4.3)

2.8 EL PASO EXPANSION PROPOSAL

El Paso proposes to expand its existing pipeline system between its Bondad Compressor Station (Bondad Station) in La Plata County, Colorado, and its Hackberry Compressor Station (Hackberry Loop) in Mohave County, Arizona (see Figure 2.2-1). El Paso has proposed a 400 MMcfd expansion case.

El Paso proposes to expand by looping 14.8 miles. The expansion would directly affect 179 acres during construction and 107 acres while operational. The various expansion loop segments do not pass in close proximity to any officially designated park, scenic, wilderness, or recreational areas. Under this 400 MMcfd case, Window Rock A and Navajo A Loops are on the Navajo Reservation in Arizona (Map 3-1 Base Case). The facilities for a 600 MMcfd expansion case will be described in Section 2.10. The route of the pipeline and the portions of the pipeline to be expanded are plotted on 1:250,000 scale maps for each case (Map 3).

2.8.1 Facilities

The proposed facilities expansion to provide 400 MMcfd is as follows:

o install 5.8 miles of 30-inch O.D. pipe (Window Rock A Loop), Apache County, Arizona,

o install 9.0 miles of 30-inch O.D. pipe (Navajo A Loop), Navajo County, Arizona.

2.8.2 Construction, Operation, and Maintenance

The El Paso Expansion Project will follow the construction, operation and maintenance procedures covered in the general discussion of construction operation and maintenance.

2.8.3 Environmental and Safety Controls

Primary environmental and safety controls for the proposed line would follow the procedures outlined in the general section on environmental controls discussed in Section 2.1.1.4.

2.8.4 Future Plans and Abandonment

~~The applicant has developed no plans for future expansion or modification of the project. However, it has indicated an intention to make any subsequently required facilities compatible with those of the proposal. No abandonment procedures for the project have been supplied by the applicant; however, procedures would probably follow those outlined for the Mojave proposal.~~ Upon cessation of operation, the pipeline loops would be purged and abandoned in place. Ancillary facilities would be dismantled and salvaged to the extent feasible. If the 100/500 case or 200/400 case were constructed, compressor units installed as part of the project would be de-activated and moved, as needed, to other locations. Any areas disturbed during abandonment would be revegetated and restored in accordance with applicable agency regulations in effect at that time.

2.9 EL PASO ROUTE ALTERNATIVES

No specific route alternatives were identified for the analysis.

2.10 EL PASO SYSTEM ALTERNATIVES

Under this alternative, only El Paso would deliver natural gas to the Mojave pipeline system (see Figure 2.2-1). No Transwestern facilities would be involved. El Paso would deliver the full 600 MMcfd to Mojave with a portion being provided to El Paso by Northwest Pipeline Company at Ignacio, Colorado. This EIR/EIS looks at two scenarios for this alternative, labeled the 100/500 and 200/400 cases. In the first case Northwest would deliver 100 MMcfd to El Paso at Ignacio and El Paso would make up the remaining 500 MMcfd from receipt points in West Texas as proposed in its Base Case. In the second case Northwest would deliver 200 MMcfd with the remaining 400 MMcfd coming from West Texas.

Neither El Paso nor Northwest are proposing the cases studied for this alternative. They arose from the inclusion in El Paso's original application (which has now been modified) of volumes of up to 200 MMcfd to be received from Northwest. Prior to the change in El Paso's proposed case, all environmental analysis of the attendant Northwest facilities had been completed. Moreover the analysis identified viable alternatives to the proposed system modifications to supply Mojave. Therefore, the analysis remains in the final EIR/EIS.

For instance, El Paso could also supply the entire 600 MMcfd to Mojave from west Texas, again with no involvement by Transwestern. This 0/600 case could require looping of about 108 miles of El Paso's San Juan Crossover pipeline in Texas and New Mexico in addition to most of the 100/500 case facilities. The Bondad compression and Blanco loop of the 100/500 case would not be required for the 0/600 case. Total facility requirements would be about 305 miles of looping and replacement and 5,300 horsepower of compression.

This 0/600 case is identified for information only; analysis of the impact of the San Juan Crossover facilities has not been included for four reasons. The first reason is that the 0/600 facilities were identified too late for inclusion in the DEIS. Second, since the 0/600, 100/500, or 200/400 alternatives would require new applications before the FERC the additional impacts would be analyzed at that time. Third, because of the proximity of the El Paso and Transwestern pipelines in New Mexico the impacts are expected to be similar. And finally, the 100/500 case allows the decisionmakers to view a representative system without Transwestern to determine whether approval of Transwestern portion of the project is needed.

It is important for the reader to understand that no applications for the facilities or service to support the 600 MMcfd alternative have been filed with any agency. If the FERC should decide that either Mojave or El Dorado should be approved, and that one of these scenarios should be substituted for the El Paso and Transwestern proposals, new applications would be required from El Paso and Northwest. While this EIR/EIS analyses the environmental effects of conceptual facilities for these cases, it may be necessary to supplement the EIR/EIS if the new applications involve different facilities.

2.10.1 The 100/500 Case

El Paso's facility requirements for the 100/500 case are similar to those for the 200/400 case discussed below. For the 100/500 case the Chaco, White Rock, and Gallup Loops are not needed, only 3580 hp of compression would be needed at Bondad, but all the other facilities required for the 200/400 case remain the same. In addition, five minor sections of existing pipeline in the vicinity of Grants, New Mexico, would need to be replaced. These replacements total 5.3 miles of pipe but only 3.2 miles of ROW would be affected since two of the sections are coincident. The total looping requirements for the 100/500 case (including the above 5.3 miles of replacement) would be 211.9 miles. Hydrostatic testing would be required on a 37.6 mile segment of pipeline including the 5.3 miles of replacement (Map 3-1 through 3-12).

In order to support the 100/500 case, Northwest would need 8.1 miles of looping and 14,370 hp of compression identified in Table 2.10-1.

2.10.2 The 200/400 Case

El Paso's facilities expansion to provide 600 MMcfd for the 200/400 Case is as follows:

- install 14.6 miles of 30-inch O.D. pipe (Blanco Loop),
- install 6.5 miles of 34-inch O.D. pipe (Chaco Loop),
- install 5.4 miles of 34-inch O.D. pipe (White Rock Loop),
- install 5.2 miles of 34-inch O.D. pipe (Gallup Loop),
- install 5.8 miles of 34-inch O.D. pipe (Window Rock A Loop),
- install 31.7 miles of 34-inch O.D. pipe (Window Rock B Loop),
- install 9.0 miles of 34-inch O.D. pipe (Navajo A Loop),
- install 40.6 miles of 34-inch O.D. pipe (Navajo B Loop),
- install 20.7 miles of 34-inch O.D. pipe (Leupp Loop),
- install 13.3 miles of 34-inch O.D. pipe (Williams A Loop),
- install 16.4 miles of 34-inch O.D. pipe (Williams B Loop),
- install 30.0 miles of 34-inch O.D. pipe (Seligman Loop),
- install 24.5 miles of 34-inch O.D. pipe (Hackberry Loop),
- add two 3,580 hp compressors at the Bondad Station,
- add one 5,300 hp compressor at the Hackberry B Station
- rewheel the Dilkon and the Hackberry B Stations, and
- change-out the gear box on the second unit and rewheel two units at the Seligman A Station, and modify 600 feet of pipeline at the Wenden Station.

The total facility requirement for the 200/400 MMcfd case would be 223.7 miles of looping by El Paso and 12,460 hp of compression (Map 3-1 through 3-12). Approximately 2,711 acres would be directly affected during construction and 1,627 acres would be affected during operation of the looping. The various expansion loop segments do not pass close to any officially designated park, scenic, wilderness or recreational areas. The White Rock, Window Rock, Navajo, and Leupp Loops are all on the Navajo Reservation.

2.10.3 Northwest Expansion Project

Northwest has additional facility needs to support the 200/400 case. Northwest has stated that 162 miles of 24-inch loop pipeline, at various intervals, would be required south of the Muddy Creek Compressor Station at Opal, Wyoming, to Ignacio, Colorado, with an additional 30,000 hp of compression at three separate sites (see Figure 2.2-1). Total cost would be $130,000,000. In its statement, Northwest indicated it would need to construct through Douglas Pass, south of Rangely, Colorado, and in Moab Canyon, Utah (two areas of difficult terrain and potential maintenance problems) and through Arches National Park, the town of Moab, Utah, and across the Colorado River. However, additional preliminary analysis by the FERC staff indicates these areas may all be avoided by moving portions of the company's identified loops. The relocated loops constitute the Northwest facility construction which this EIS/EIR evaluates. The facilities necessary to expand Northwest's system are identified in Table 2.10-1 and are plotted on 1:250,000 scale maps (Map 3(NW)-1 through 8). These facilities would result in disturbance of 1,178 acres during construction and 884 acres during operation.

2.11 TRANSWESTERN EXPANSION PROPOSAL

Transwestern Pipeline Company (Transwestern) proposes to expand its existing pipeline system between Pyote, Texas, and its Needles, Arizona, metering station (see Figure 2.2-1). The route of the pipeline and the portions of the pipeline to be looped are plotted on 1:250,000 scale maps (Map 4-1 through 4-16). Transwestern's existing West Texas Lateral traverses the counties of Ward, Winkler, and Loving in Texas; and Lea, Eddy, and Chaves Counties in New Mexico. The existing mainline traverses the counties of Chaves, Lincoln, Socorro, Torrance, Valencia, Cibola, and McKinley in New Mexico; and Apache, Navajo, Coconino, Yavapai, and Mohave Counties in Arizona.

Transwestern proposes to expand by looping 356.4 miles of the existing pipeline in eleven loop segments. An increase of 320 MMcfd capacity would be achieved by this design. The expansion would directly affect 4,315 acres of land during construction and be reduced to 2,160 acres during operation. All proposed expansion loops parallel (within 30 to 50 feet) the existing Transwestern system. Construction activities will normally be confined to the 50-foot-wide permanent ROW and the additional 50-foot-wide temporary use space for construction along the proposed route. None of the eleven proposed pipeline expansion loops cross major rivers, wilderness areas, wilderness study areas, or Rare II areas in Texas, New Mexico, or Arizona. Proposed Loop C crosses the Laguna Indian Reservation in New Mexico; proposed Loops D, E, and F traverse the Navajo Indian Reservation in New Mexico and Arizona; proposed Loop G traverses the Coconino and Kaibab National Forests in Arizona; and proposed Loop I traverses the Fort Mojave Indian Reservation in Arizona. Table 2.11-1 lists the mileage for the various pipeline loops by county.

Table 2.10-1

GEOGRAPHIC DISTRIBUTION OF FACILITIES, NORTHWEST EXPANSION PROJECT [1]

State/County	Miles of pipe for 200 MMcfd (100 MMcfd)	Facility Name Total length in miles for 200 MMcfd, compression in horsepower for 200 MMcfd or 100 MMcfd
WYOMING		
Lincoln	18.3 (8.1)	Muddy Creek Loop (34.6 miles)
Sweetwater	16.3 (-)	Muddy Creek Loop
	-	Green River Compressor Station (existing) (upgrade by 2,000 hp for 100 or 200 MMcfd)
	4.1 (-)	Green River Loop (4.1 miles)
COLORADO		
Rio Blanco	29.2 (-)	Rangely Loop A (30.8 miles)
Garfield	1.6 (-)	Rangely Loop A
	14.7 (-)	Rangely Loop B (16.2 miles)
Mesa	1.5 (-)	Rangely Loop B
Dolores	-	Cahone Compressor Station (new) (8,960 hp) 3,680 hp for 100 MMcfd
	1.5 (-)	Cahone Loop (16.3 miles)
Montezuma	14.8 (-)	Cahone Loop
La Plata	-	Ignacio Compressor Station (existing) (add 6,000 hp) 3,000 hp for 100 MMcfd
UTAH		
Grand	-	Cisco Compressor Station (new) (8,330 hp) 5690 hp for 100 MMcfd
	25.7 (-)	Cisco Loop (25.7 miles)
	4.5 (-)	Moab Loop (34.8 miles)
San Juan	30.3 (-)	Moab Loop

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[1] Significant facility additions are listed. Piping modifications would also be necessary within the following existing compressor station sites: Ignacio, Rangely (Rio Blanco County, Colo.), and Vernal (Uinta County, Utah)

Table 2.11-1

GEOGRAPHIC DISTRIBUTION OF FACILITIES, TRANSWESTERN EXPANSION PROPOSAL

State/County	Designation	Milepost	Miles
TEXAS			
Ward	West Texas Lateral Loop 1	0.0-4.1	4.1
NEW MEXICO			
Eddy	West Texas Lateral Loop 2	77.5-88.0	10.0
Lea	West Texas Lateral Loop 2		0.5
Subtotal for Loops 1 and 2			14.6
Lincoln	Mainline Loop A	29.0-55.0	26.0
Lincoln	Mainline Loop B	86.6-131.35	9.2
Socorro	Mainline Loop B		12.0
Torrance	Mainline Loop B		23.5
Valencia	Mainline Loop C	173.25-200.5	16.7
Cibola	Mainline Loop C		10.5
Cibola	Mainline Loop D	224.0-271.25	18.0
McKinley	Mainline Loop D		29.3
McKinley	Mainline Loop E	303.25-340.75	7.5
ARIZONA			
Apache	Mainline Loop E		30.0
Navajo	Mainline Loop F	375.25-416.75	37.0
Coconino	Mainline Loop F		4.5
Coconino	Mainline Loop G	449.0-485.5	36.5
Yavapai	Mainline Loop H	526.75-576.25	38.2
Mohave	Mainline Loop H		11.2
Mohave	Mainline Loop I	613.0-644.5	31.5
Subtotal for Loops A through I			341.6
TOTAL		356.35	356.2

2.11.1 Facilities

Transwestern proposes to expand by looping various segments of pipeline along the existing system. A total of 356.4 miles of 30-inch O.D. buried pipe, in 11 separate loops, will be added to the Transwestern Mainline and West Texas Lateral between Pyote, Texas, and the Needles meter station in Arizona.

The West Texas Lateral extends from the Pyote Plant in Texas to Roswell, New Mexico. The Transwestern proposed mainline designation extends from Roswell to the Needles meter station in Arizona. The Transwestern looped segments are identified as Loops 1 and 2 for the West Texas Lateral and Loops A through I for the mainline. There are two compressor stations on the West Texas Lateral, WT-1 and WT-2. Along the mainline there are nine compressor stations, numbered from one to nine. No new compressor stations or increased compression would be required to implement the proposed expansion.

2.11.2 Construction, Operation, and Maintenance

A generalized discussion of construction has been included in Section 2.1.1. Transwestern would follow the construction methods outlined in that section. Details of the construction manpower requirements are presented below.

Transwestern intends to construct the looping projects using four spreads. Spread No. 1 would construct 4.05 miles of pipeline in Texas and 14.00 miles of pipeline in New Mexico. This spread would employ 230 people with 65 percent nonlocal workers and 35 percent local workers. Work on this spread would be completed in 60 days.

Spread No. 2 would complete looping on 97.35 miles in New Mexico. It would employ 350 people and work would be completed in 255 days. Spread No. 3 would construct 127.19 miles of pipeline loop; 41 miles would be in New Mexico. This spread would employ 375 people and be completed in 271 days. Spread No. 4 would construct 118.88 miles of looping in Arizona employing 362 people. Work would be completed in 262 days.

2.11.3 Environmental and Safety Controls

Environmental and safety controls discussed in Section 2.1.1.4 will be utilized by Transwestern.

2.11.4 Future Plans and Abandonment

Future plans for the Transwestern system could conceivably consist of another looping expansion project. Upon cessation of operation, the underground pipeline would be purged and abandoned in place. Ancillary surface facilities would be dismantled, equipment would be salvaged if possible; the ROW and surface facility sites would be revegetated and restored in accordance with applicable agency regulations in effect at that time.

2.12 TRANSWESTERN ROUTE ALTERNATIVES

No specific route alternatives were identified for analysis.

2.13 TRANSWESTERN SYSTEM ALTERNATIVES

(see Section 2.10)

2.14 ROUTE AND SYSTEM ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Using screening criteria the following route and system alternatives were eliminated from detailed analysis. A full discussion of the screening criteria can be found in Volumes II and III. The specific criteria by which an alternative is eliminated are presented with each rejected case.

2.14.1 Mojave Route Alternatives

The following Mojave route alternatives were eliminated from further consideration:

- o Alternative 1 would follow the boundary between Townships 9 and 10 North from the existing Pacific Lighting Company pipeline crossing of the Colorado River near Needles and would intersect the proposed Mojave route east of Toomey on I-15. This alternative to the Mojave Mainline would still require construction of the Mojave Transfer Line. The alternative did not provide a clear and significant environmental advantage since it crosses the East Mojave Scenic Area which has been proposed to be part of Mojave National Park. The alternative was eliminated using screening criterion E-6 which is defined in Volume II, Section 2.7.6.

- o Alternative 2 would follow BLM utility corridor F south from Needles to Topock. It would still require construction of the Mojave Transfer Line. The alternative was rejected using screening criterion E-4 because the cost was more than 10 percent of the route it would avoid, and it offers no clear and significant environmental advantage. Screening criterion E-4 is defined in Volume II, Section 2.7.4.

- o Alternative 3 would follow I-40 from Needles to the proposed route near Argos. It would still require construction of the Mojave Transfer Line. This alternative was rejected because it did not provide a clear environmental advantage over the portion of the route it replaced. The route does not follow a designated BLM utility corridor in the California Desert Conservation Area. Based on these considerations the alternative was rejected using screening criterion E-5 which is defined in Volume II, Section 2.7.5.

2.14.2 El Paso System Alternative

The use of Transwestern supplying the full 600 MMcfd to Mojave instead of using any El Paso capacity was considered and eliminated because it cost more than 10 percent of the system it would avoid and it offers no clear and significant environmental advantage. The alternative was eliminated using screening criterion E-5.

2.15 INTERRELATIONSHIP WITH OTHER PLANNED OR PROPOSED PROJECTS

Projects that are in the planning stages in the relevant portions of the various project areas are also being examined to determine which ones are likely to be in the construction phase during 1987 and 1988. Other planned projects that have the potential to result in incremental additive and/or additive effects on the pipeline will be considered, as appropriate, in the cumulative impact analysis. The criteria for consideration of other planned projects are as follows:

- the planned project would be constructed during 1987 and 1988;
- the planned project is clearly in the development stage;
- the planned project would result in impacts to the same geographic area of influence as the proposed projects including alternatives.

The projects considered for cumulative impacts include the Celeron/All American Pipeline Project, the Getty (Texaco) Pipeline Project, the Palo Verde-Devers Transmission Line System, the Mead/McCullough-Victorville/Adelanto Transmission Project, and the Mead/Phoenix Transmission Line Project between Boulder City, Nevada, and Phoenix, Arizona. Several other projects within the San Joaquin Valley could also have cumulative effects on plant and wildlife species. These include: urban development, mineral development and commodity production, wind energy development and flood control and reservoir construction.

The Wy-Cal Project

On August 8, 1987, Wyoming-California Pipeline Company (Wy-Cal) filed an application with FERC in Docket No. CP87-479-000 to construct (a) approximately 1,007 miles of 16-, 20-, 24-, 26-, 30-, and 36-inch diameter pipeline between Hams Fork, Lincoln County, Wyoming and Bakersfield, California by way of Topock, Mojave County, Arizona; (b) four compressor stations totaling 53,000 hp in Lincoln County, Wyoming, Millard County, Utah, Clark County, Nevada, and San Bernardino County, California; and (c) various measurement and communication facilities. Wy-Cal proposes to transport up to 410 MMcfd between southwest Wyoming and Piute Junction, California and up to 650 MMcfd between Piute Junction and Bakersfield. In essence, Wy-Cal is a combination of the Mojave Project (Volume I) and the Kern River Project (Volume II), the East Las Vegas System Alternative (Volume II), and approximately 60 miles of pipeline facilities in southwest Wyoming not addressed in this EIR/EIS.

On August 10, 1987, the California Public Utilities Commission (CPUC) filed a motion in part to consolidate the Wy-Cal application with the Mojave comparative proceedings claiming that the applications are mutually exclusive since the EOR market will only support one pipeline and Wy-Cal proposes to occupy the rights-of-way proposed by each of the other applicants. On October 20, 1987, the FERC denied CPUC's motion to consolidate on the basis that consolidation would prejudice the parties and cause undue delay in the proceedings. The FERC also noted that no applicant seeks such consolidation. Rather, the motion to consolidate was filed by an intervenor who opposes all of the applications. As a result of the FERC decision, Wy-Cal is not a competive, mutually exclusive applicant and therefore will not be analyzed in this EIR/EIS. That is not to say this EIR/EIS won't be used in a separate environmental review of the Wy-Cal Project. This EIR/EIS will most likely serve as the base for the environmental analysis of the Wy-Cal project and combined with a separate analysis for the Wy-Cal facilities not covered in this EIR/EIS.

3.0 - AFFECTED ENVIRONMENT

3.1 MOJAVE PIPELINE PROPOSAL

3.1.1 Air Quality

Because the proposed projects will result in the release of air pollutants during their construction and operation phases, compliance with a number of federal, state, and local regulations is required. Project-related sources during construction and operation will emit particulates, carbon monoxide, sulfur oxides, and nitrogen oxides. The specific regulations that are applicable to the proposed projects are described in the Air Quality/Meteorology Technical Report.

Table 3.1-1 summarizes the federal primary and secondary air quality standards as well as the state standards for pollutants of interest to the proposed projects.

The Clean Air Act Amendments of 1977 established a federal program for Prevention of Significant Deterioration (PSD) of ambient air quality where the air is in an attainment or unclassified designation. Three classes of protection were included in the 1977 Amendments to the Clean Air Act (CAA). Class I was identified as the cleanest locations with virtually no degradation allowed. Mandatory Class I areas include national and international parks, national wilderness areas, and national memorial parks. Class II allows moderate degradation, and Class III allows the largest degradation. However, no degradation above the National Ambient Air Quality Standards (NAAQS) is permitted. No Class I areas designated in the Act can be redesignated. The maximum allowable increments under PSD regulations are identified in the Air Quality/Meteorology Technical Report.

Sources subject to PSD review are new major stationary sources and major modifications meeting the test of geographic applicability. A source is considered major if, 1) it is one of the 28 named source categories listed in Section 169 of the CAA and emits or has the potential to emit 100 tons per year or more of any pollutant regulated by the CAA, or 2) it is an unlisted stationary source that emits or has the potential to emit 250 tons per year or more of any pollutant regulated by the CAA after controls are installed.

The emission determination for PSD applicability must be conducted separately for each pollutant emitted by the new source or modification subject to regulation by the CAA.

Pollutant emissions that occur during construction (mobile emissions) are exempted from PSD review because the PSD

Table 3.1-1

SUMMARY OF AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Time	Federal, [1] Arizona, Colorado, and Texas Standards		California Standard	New Mexico Standard
		Primary	Secondary		
Ozone	1-hour [2]	235 ug/m^3 (.12 ppm)	235 ug/m^3 (.12 ppm)	.10 ppm	0.06 ppm
Carbon Monoxide	1-hour [3]	40 mg/m^3 (35 ppm)	40 mg/m^3 (35 ppm)	20 ppm	13.10 ppm
	8-hour [2]	10 mg/m^3 (9 ppm)	10 mg/m^3 (9 ppm)	9 ppm	8.70 ppm
Nitrogen Dioxide	Annual	100 ug/m^3 (.05 ppm)	100 ug/m^3 (.05 ppm)	-	0.05 ppm
	1-hour			.25 ppm	-
Sulfur Dioxide	3-hour [2]	-	1300 ug/m^3 (.50 ppm)	-	-
	24-hour [2]	365 ug/m^3 (.14 ppm)	-	.05 ppm	0.10 ppm
	Annual	80 ug/m^3 (.03 ppm)	-	-	-
	1-hour	-	-	.25 ppm	-
Particulates (TSP)	24-hour [2]	260 ug/m^3	150 ug/m^3	-	150 ug/m^3
	Annual (Geom. Mean)	75 ug/m^3	60 ug/m^3	-	60 ug/m^3
Lead	Calendar-Quarter	1.5 ug/m^3	1.5 ug/m^3	-	-
	30-day avg.	-	-	1.5 ug/m^3	-

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[1] In micrograms per cubic meter (ug/m^3), and parts per million (ppm)
[2] Not to be exceeded more than 1 day per year, based on a 3-year running average
[3] Not to be exceeded more than once per year
- not available

Notes: 1) Federal standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year
2) State standards are not to be equaled or exceeded

regulations specifically exempt temporary increases of SO_2 and TSP emissions. Temporary is defined by EPA as less than two years, although this period can be increased at the discretion of the EPA Administrator. In addition, mobile emissions are exempt from PSD review.

The proposed projects may be subject to New Source Review (NSR) regulations established by the states or counties where they will be located. Compliance with these regulations will be required before a "permit to construct" is granted. These regulations may apply to major stationary sources such as compressor stations in nonattainment areas (NA). A source is major if it will emit 100 tons per year or more of a regulated pollutant.

In general, if a proposed major source or major modification of an existing source is to be located in a nonattainment area (NA) the new emissions need to be more than offset by reductions in emissions from existing sources within the area. This means that the air must be cleaner after emissions from the new sources are added. Air pollution control under New Source Review requires a new source locating in a NA to install Best Available Control Technology (BACT) or the Lowest Achievable Emission Rate (LAER). LAER is more stringent than BACT and New Source Performance Standards (NSPS) and it is defined as the lowest emission rate allowed or achieved anywhere in the nation without regard to cost or energy use.

The existing air quality conditions along the routes proposed for each pipeline and its alternatives are described below. Due to the vast distances covered by the proposed projects and the sparseness of available data, data from monitoring stations closest to the pipeline routes are used. Characterization of existing air quality is based on the pollutant concentrations measured from 1982 through 1984. Tables 3.1-2 through 3.1-4A list the measurements of relevant pollutants for Arizona (Table 3.1-2) and California (Kern County in Table 3.1-3 and San Bernardino County in Table 3.1-4A). Tables 3.1-4B and 3.1-4C list the measurements of relevant pollutants for Colorado and New Mexico. These air quality data were taken from annual summaries published by the air pollution control agencies of each state.

The proposed Mojave Pipeline includes the Mojave Transfer Line, Mojave Mainline and Kern Lateral. The nearest PSD Class I area is the Dome Land Wilderness which is about 40 miles south of the proposed pipeline.

In the vicinity of the Mojave Transfer Line, air quality measurements for 1982 through 1984 at nearby monitoring stations are shown in Table 3.1-2. Measurements at the Bullhead City monitoring station show exceedances of the federal annual TSP standards (both primary and secondary). Although exceedances of the federal TSP annual standards occur due to rural fugitive dust, Mohave County is in attainment for all pollutants, with the overall air quality of the county considered good.

Table 3.1-2

SUMMARY OF RELEVANT AIR QUALITY DATA IN ARIZONA

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Flagstaff	1982	0.09	-	-	-	-	-	-	417	77	15	7
	1983	0.08	-	-	-	-	-	-	193	68	13	8
	1984	0.08	-	-	-	-	-	-	323	62	19	7
Joseph City	1982	-	92	15	-	192	25	2	559	30	-	-
	1983	-	-	-	-	-	-	-	153	27	-	-
	1984	-	-	-	-	-	-	-	315	34	-	-
Bullhead City	1982	-	109	29	-	147	42	27	137	70	-	-
	1983	-	115	30	-	100	41	27	209	84	-	-
	1984	-	141	31	-	115	39	27	215	93	-	-
Nelson	1982	-	-	-	-	-	-	-	177	42	-	-
	1983	-	-	-	-	-	-	-	178	42	-	-
	1984	-	-	-	-	-	-	-	242	75	-	-
Riviera	1982	-	-	-	-	175	110	28	93	35	-	-
	1983	-	-	-	-	148	52	28	93	35	-	-
	1984	-	-	-	-	157	57	28	154	42	-	-
Davis Dam	1982	-	-	-	-	238	63	30	86	21	-	-
	1983	-	-	-	-	160	46	28	71	25	-	-
	1984	-	-	-	-	149	44	28	80	25	-	-

Table 3.1-3

SUMMARY OF RELEVANT AIR QUALITY DATA IN SAN JOAQUIN AIR BASIN (KERN COUNTY)

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Taft	1982	-	-	-	-	-	-	-	278	88	-	-
	1983	-	-	-	-	-	-	-	233	73	-	-
	1984	-	-	-	-	-	-	-	215	95	-	-
Oildale	1982	0.13	207	43	288	-	110	29	260	91	-	-
	1983	0.14	170	47	236	-	123	31	359	93	-	-
	1984	0.14	207	38	288	-	81	24	274	122	-	-
Kern Refuge	1982	-	-	-	-	-	-	-	110	40	-	-
	1983	-	-	-	-	-	-	-	165	37	-	-
	1984	-	-	-	-	-	-	-	148	53	-	-
Bakers-field	1982	0.16	207	57	236	-	100	16	250	116	16	13
	1983	0.14	264	57	393	-	131	16	239	110	16	10
	1984	0.13	264	52	105	-	39	8	328	122	13	8
Edison	1982	0.18	-	-	-	-	-	-	-	-	-	-
	1983	0.16	-	-	-	-	-	-	-	-	-	-
	1984	0.17	-	-	-	-	-	-	-	-	-	-

Table 3.1-4A

SUMMARY OF RELEVANT AIR QUALITY DATA IN SOUTHEAST DESERT AIR BASIN

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Mojave	1982	-	-	-	-	-	-	-	186	68	-	-
	1983	-	-	-	-	-	-	-	319	73	-	-
	1984	-	-	-	-	-	-	-	290	80	-	-
Lancaster	1982	0.16	150	30	-	-	-	-	113	64	12	6
	1983	0.18	169	28	-	-	-	-	141	55	15	7
	1984	0.18	207	34	-	-	-	-	180	73	12	6
Boron	1982	-	-	-	-	-	-	-	140	43	-	-
	1983	-	-	-	-	-	-	-	170	45	-	-
	1984	-	-	-	-	-	-	-	130	59	-	-
Barstow	1982	0.16	376	47	-	-	-	-	116	46	12	4
	1983	0.15	282	43	-	-	-	-	87	64	9	3
	1984	0.12	226	45	-	-	-	-	144	60	7	3
Victor-ville	1982	0.20	226	38	-	-	-	-	237	59	6	4
	1983	0.23	244	39	-	-	-	-	125	69	-	-
	1984	0.23	301	40	-	-	-	-	338	90	-	-
Twenty-Nine Palms	1982	0.13	-	-	-	-	-	-	96	41	4	2
	1983	0.16	-	-	-	-	-	-	175	45	-	-
	1984	0.13	-	-	-	-	-	-	156	56	-	-

Table 3.1-4B

SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Durango	1982	-	-	-	-	-	-	-	136	53	-	-
	1983	-	-	-	-	-	-	-	182	60	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Cortez	1982	-	-	-	-	-	-	-	82	35	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Pasoga Springs	1982	-	-	-	-	-	-	-	376	120	-	-
	1983	-	-	-	-	-	-	-	268	10	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Mesa Verde National Park	1982	-	-	-	-	-	-	-	61	7	-	-
	1983	-	-	-	-	-	-	-	33	8	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Meeker	1982	-	-	-	-	-	-	-	225	55	-	-
	1983	-	-	-	-	-	-	-	131	43	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Grand Junction 5th & Rod	1982	-	-	-	-	-	-	-	196	73	-	-
	1983	-	-	-	-	-	-	-	181	68	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Telluride	1982	-	-	-	-	-	-	-	310	79	-	-
	1983	-	-	-	-	-	-	-	233	76	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-

Table 3.1-4C

SUMMARY OF RELEVANT AIR QUALITY DATA IN NEW MEXICO

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Gallup	1982	-	-	-	-	-	-	-	450	104	-	-
	1983	-	-	-	-	-	-	-	357	98	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Bluewater	1982	-	-	-	-	-	-	-	192	59	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Kerr McGee	1982	-	-	-	-	-	-	-	278	43	-	-
	1983	-	-	-	-	-	-	-	297	28	-	-
	1984	-	-	-	-	-	-	-	86	20	-	-
United Nuclear	1982	-	-	-	-	-	-	-	170	45	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Milan	1982	-	-	-	-	-	-	-	315	93	-	-
	1983	-	-	-	-	-	-	-	316	102	-	-
	1984	-	-	-	-	-	-	-	292	101	-	-
Montgomery & San Mateo	1982	0.10	94	38	-	52	26	-	159	63	22	16
	1983	0.10	-	-	-	52	26	-	145	62	21	13
	1984	0.09	-	-	-	52	26	-	207	91	21	13
San Mateo	1982	-	-	-	-	-	-	-	71	34	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Paguate	1982	-	-	-	-	-	-	-	257	35	-	-
	1983	-	-	-	-	-	-	-	160	40	-	-
	1984	-	-	-	-	-	-	-	137	36	-	-
Belen	1982	-	-	-	-	-	-	-	212	78	-	-
	1983	-	-	-	-	-	-	-	203	62	-	-
	1984	-	-	-	-	-	-	-	226	78	-	-

Table 3.1-4C (continued)

SUMMARY OF RELEVANT AIR QUALITY DATA IN NEW MEXICO

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
Roswell	1982	-	-	-	-	-	-	-	216	77	-	-
	1983	-	-	-	-	-	-	-	211	79	-	-
	1984	-	-	-	-	-	-	-	153	67	-	-
Artesia Roselawn St.	1982	-	-	-	-	-	-	-	-	-	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	318	-	-	-
Artesia 13th St	1982	-	-	-	-	-	-	-	138	46	-	-
	1983	-	-	-	-	-	-	-	135	46	-	-
	1984	-	-	-	-	-	-	-	219	44	-	-
Carlsbad	1982	-	-	-	-	-	-	-	170	67	-	-
	1983	-	-	-	-	-	-	-	396	75	-	-
	1984	-	-	-	-	-	-	-	281	60	-	-
Aztec	1982	-	-	-	-	-	-	-	144	51	-	-
	1983	-	-	-	-	-	-	-	140	45	-	-
	1984	-	-	-	-	-	-	-	116	43	-	-
Farmington	1982	-	-	-	-	-	-	-	182	78	23	8
	1983	-	-	-	-	-	-	-	231	67	12	6
	1984	-	-	-	-	-	-	-	157	67	10	5
NMSU E.S.	1982	-	-	-	-	-	-	-	259	36	-	-
	1983	-	-	-	-	-	-	-	140	30	-	-
	1984	-	-	-	-	-	-	-	150	36	-	-
EPNG Plant	1982	-	-	-	-	-	-	-	114	45	-	-
	1983	-	-	-	-	-	-	-	119	48	-	-
	1984	-	-	-	-	-	-	-	136	57	-	-
Reservation	1982	-	-	-	-	524	105	-	98	40	-	-
	1983	-	-	-	-	707	105	-	76	30	-	-
	1984	-	263	0	-	524	131	-	99	41	-	-

The proposed Mojave Mainline extends approximately 325 miles from Topock in western Mohave County, Arizona, to Bakersfield, California. This pipeline is within San Bernardino County and Kern County in the Southeast Desert Air Basin, California. Existing air quality in the vicinity of the proposed Mojave Mainline is poor, degrading from east to west along the mainline route. The majority of the portions of San Bernardino and Kern counties through which the proposed Mojave Mainline passes are designated as nonattainment. Kern County is in nonattainment for carbon monoxide (CO), ozone (O_3), and total suspended particulates (TSP), and San Bernardino County is designated as nonattainment for ozone.

The Kern Lateral portion of the proposed pipeline is located in Kern County of the San Joaquin Air Basin. Air quality measurements in Kern County are shown in Table 3.1-3.

3.1.2 Geology

Except as noted, no portion of the routes encounter areas of significant slope instability or unique geologic features, and no areas of mineral/petroleum resources which are incompatible with pipeline construction or operation are crossed.

3.1.2.1 Mojave Transfer Line

Geology and Physiography. The Mojave Transfer Line would traverse the Mojave Desert region within the western foothills of the Black Mountains of northwest Arizona. The route crosses an area of low relief characterized by alluvial fans with dissected slopes. Table 3.1-5 summarizes geologic and physiographic conditions on the transfer line.

Faulting and Seismicity. The area that would be traversed is of low seismic activity and the route does not cross any Quaternary faults.

Slope Stability. Slope instability increases locally in areas where the route crosses intermittent streams.

Subsidence. It is not known whether the proposed transfer line would traverse areas of ground subsidence. It is possible that subsidence has occurred in the past or is presently occurring due to overdrafting of the groundwater table.

3.1.2.2 Mojave Mainline

Geology and Physiography. The Mojave Mainline route from Topock, Arizona, to Mojave, California, traverses the Mojave Desert. Although discrete ranges of rugged mountains are common within this province, the proposed route generally crosses the flanking alluvial fans of intervening basins. The more significant geologic and physiographic features in this region are summarized in Table 3.1-5.

Just west of Mojave, California, the proposed route enters the Tehachapi Mountain region and the Tejon Hills of the San Joaquin Valley. The proposed route continues through the San Joaquin Valley and parallels the foothills on the east side of the Temblor Range.

Faulting and Seismicity. The proposed Mojave Mainline passes through two areas with moderate to high historic seismic activity [Real et al., 1978]. The first of these includes an area of moderate historic seismic activity within the central Mojave Desert between Barstow, California, and Bagdad, California (MP 84-154). The Manix earthquake of April 10, 1947 remains the largest recorded seismic event in this region. This earthquake registered a magnitude of 6.2 [Keaton and Keaton, 1977]. Several other seismic events with magnitudes between 5.0 and 5.9 have occurred within 10 miles of the proposed route.

Both the San Joaquin Valley and Tehachapi Mountains have experienced moderate to high seismicity in historic time. Examples of high seismic activity include the Fort Tejon earthquake of January 9, 1857 on the San Andreas Fault, estimated as greater than magnitude 8, which caused moderate to strong ground shaking throughout this region. The July 21, 1952 Kern County earthquake, magnitude 7.7 on the White ~~Wall~~ Wolf Fault, caused strong to very strong ground shaking in San Joaquin Valley [Livingston and Associates/Moore and Taber, 1979]. Moderate to high magnitude earthquakes occurred as aftershocks of the Kern County earthquake [Richter, 1955a].

Two significant northeast-trending faults bound the Tehachapi Mountains: the White Wolf fault on the northwest and the Garlock fault on the southeast [Jennings, 1975]. The White Wolf fault ruptured at the surface during the 1952 Kern County earthquake [Jennings, 1975]), but it did not rupture where the Mojave Mainline would cross (MP 268). The Garlock fault exhibits significant left-lateral movement of Quaternary age, and local movement occurred in the vicinity of the proposed Mojave Mainline crossing (MP 234) during the 1952 Kern County earthquake [Buwalda and St. Amand, 1955]. Several faults traversed in the Mojave Desert, the Tehachapi Mountains, and the San Joaquin Valley exhibit evidence of movement during the Quaternary period (last two million years), but evidence of movement within Holocene time (last 11,000 years) has not been discovered [Jennings, 1975]. These faults are listed in Table 3.1-6. The PreQuaternary faults listed in Table 3.1-6 are included because they are either connected to active faults, or are oriented so that they could move in response to the present day stress (this generally means that they parallel nearby active or Quaternary faults).

Table 3.1-5

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, MOJAVE PIPELINE PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Mojave Transfer Line					
Eastern side of Mojave Valley at base of foothills of Black Mtns (MP 0-16.5)	Basin & Range	Alluvial fans	Quaternary	Low to moderate relief with dissected canyons	Unconsolidated to poorly to moderately well consolidated deposits
Mojave Mainline					
Colorado River Valley (MP 1)	Mojave Desert	Sedimentary rock, alluvium	Quaternary	Low relief, gentle slopes	Fan deposits, some stream valley alluvium, poorly consolidated rock
Saddle between Chemehuevi and Sacramento Mtns (MP 9)	Mojave Desert	Igneous and metamorphic rock	Precambrian	Low relief, moderate slopes	Hard rock
North end of Chemehuevi Valley (MP 15)	Mojave Desert	Sedimentary rock	Quaternary	Low relief, gentle slopes	Fan deposits, poorly consolidated rock
Stepladder Mtns (MP 22)	Mojave Desert	Igneous and metamorphic rock	Precambrian, Mesozoic	Moderate relief, moderate to steep slopes	Hard to very hard rock
Ward Valley (MP 26-38)	Mojave Desert	Sedimentary rock, alluvium	Quaternary	Moderate to low relief, gentle slopes	Unconsolidated to poorly consolidated material
South end of Piute Mtns. (MP 38)	Mojave Desert	Sedimentary rock, granite	Quaternary, Mesozoic	Low relief, gentle slopes	Poorly consolidated and very hard rock
Fenner Valley (MP 40-60)	Mojave Desert	Alluvium	Quaternary	Low relief, gentle slopes to flat	Unconsolidated material
South of Marble Mountains (MP 61)	Mojave Desert	Granite	Precambrian	Low relief, moderate slopes	Hard to very hard rock
North of Cadiz Valley and Bristol Lake (MP 62-102)	Mojave Desert	Sedimentary rock, alluvium	Quaternary	Low relief, gentle slopes	Unconsolidated to poorly consolidated material
Near Ludlow to near Poe (MP 102-125)	Mojave Desert	Alluvium, sedimentary, volcanic rock	Quaternary, Tertiary	Low relief, gentle to moderate slopes	Unconsolidated to hard rock

Table 3.1-5 (continued)

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, MOJAVE PIPELINE PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Calico Mountains to Hinckley (MP 141-165)	Mojave Desert	Alluvium, sedimentary rock, granite and igneous rock	Quaternary, Tertiary, Mesozoic, Paleozoic	Low to moderate relief, gentle to steep slopes	Unconsolidated, soft to hard sedimentary rocks, hard to very hard igneous rocks
Hinkley to Mojave (MP 165-220)	Mojave Desert	Alluvium, playa lake deposits, sedimentary rock and granite	Quaternary, Mesozoic	Low relief, gentle slopes to flat	Unconsolidated, poorly consolidated and very hard sedimentary and igneous rocks
Tehachapi Mountains (MP 230-260)	Tehachapi Mountains	Granite & sedimentary rock	Mesozoic	High relief, moderate to	Moderately hard to hard rock steep slopes
Cummings & Brite Valleys (MP 248-258)	Tehachapi Mountains	Alluvium	Quaternary	Low relief, gentle slopes	Unconsolidated to poorly consolidated material
Tejon Hills (MP 258-260)	San Joaquin Valley	Sedimentary rock, alluvium	Quaternary, Tertiary	Low relief, gentle slopes	Poorly consolidated rock
Southern San Joaquin Valley (MP 260-326)	San Joaquin Valley	Alluvial fans	Quaternary	Low relief, gentle slopes to flat	Unconsolidated fan deposits
Buena Vista Hills, Buena Vista Valley Tremblor Valley (MP 300-325)	San Joaquin Valley	Sedimentary rock, alluvium	Quaternary, Tertiary	Low relief, gentle slopes to flat	Unconsolidated to poorly consolidated material
		Kern Lateral			
San Joaquin Valley (MP 0-4)	San Joaquin Valley	Alluvial fans	Quaternary	Low relief, flat	Unconsolidated fan deposits
Tejon Hills (MP 4-10)	San Joaquin Valley	Sedimentary rock, alluvium	Quaternary, Tertiary	Low relief, gentle slopes	Poorly consolidated rock
San Joaquin Valley (MP 10-30)	San Joaquin Valley	Alluvial fans	Quaternary	Low relief, flat	Unconsolidated fan deposits
Hills north and east of Bakersfield (MP 30-45)	San Joaquin Valley	Sedimentary rock	Quaternary, Tertiary	Low relief, moderate slopes	Poorly consolidated rock
Mojave Valley (MP 125-141)	Mojave Desert	Playa basin deposits, dune sand, alluvium	Quaternary	Low relief, gentle slopes to flat	Unconsolidated material, salt, sand

Table 3.1-6

ACTIVE AND POTENTIALLY ACTIVE FAULTS, MOJAVE MAINLINE

Fault Name	Location	Age of Last Movement	References
Unnamed	MP 7	preQuaternary	Jennings [1975]
Piute Mtns.	MP 39	preQuaternary	Jennings [1975]
Unnamed	MP 62	preQuaternary	Jennings [1975]
Ludlow	MP 98	Quaternary	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Unnamed	MP 104	preQuaternary	Jennings [1975]
Unnamed	MP 117	preQuaternary	Jennings [1975]
Pisgah	MP 120 (MJb 4)	Quaternary	Jennings [1975]; Greensfelder [1974]; Real et al. [1978]
Calico	MP 142	Quaternary	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Harper	MP 152 (MJb 34)	Quaternary	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Unnamed	MP 159 (MJb 41)	preQuaternary	Jennings [1975]
Lockhart	MP 165 (MJb 48)	Quaternary	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Helendale	MJb 63	Quaternary	Jennings [1965]
South Lockhart	MP 180	Quaternary	Jennings [1975]; Real et al. [1978]
Unnamed	MP 189	preQuaternary	Jennings [1975]
Unnamed	MP 199	preQuaternary	Jennings [1975]
Muroc	MP 205	preQuaternary	Jennings [1975]

Table 3.1-6 (continued)

ACTIVE AND POTENTIALLY ACTIVE FAULTS, MOJAVE MAINLINE

Fault Name	Location	Age of Last Movement	References
Garlock	MP 234	1952	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Tejon Canyon	MP 255	preQuaternary; connects to Garlock	Jennings [1975]
Springs	MP 259	Quaternary	Jennings [1975]
White Wolf	MP 268	1952	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Buena Vista	MP 300	active creep	Jennings [1975]; Real et al. [1978]
Elk Hills	MP 317	Quaternary	Jennings [1975]

Algermissen et al. [1982] estimate that for a given 50-year period, there is a 90 percent probability that horizontal ground acceleration would not exceed 6 to 40 percent of gravity in the region of the proposed Mojave Mainline. This equates to a return period of approximately 500 years. The ground motion hazard generally increases from east to west, reaching a maximum in the vicinity of the San Andreas Fault. These values are for rock sites. Depending on the characteristics of the soil profile, actual earthquake motion at the ground surface may be different. Seismic soil liquefaction is a potential hazard wherever loose granular or lacustrine deposits are saturated near the surface and where there is a significant probability for strong ground shaking.

Slope Stability. Steep slopes in the Mojave Desert may produce rockfalls, especially in association with seismic activity. The 1952 Kern County earthquake caused extensive landsliding in the Tehachapi Mountains. Landslides occurred more extensively in sheared granite rock on the southeast side of the Tehachapi Mountains and in some of the Quaternary and Tertiary sediment rocks on the northwest side, including the Chanac Creek and El Tejon areas. Debris flows occur locally and are associated with alluvial fans.

Subsidence. Subsidence of up to eight feet, due mainly to groundwater overdrafting, has occurred in the southernmost San Joaquin Valley between Mettler and Maricopa, California (MP 270-295) [Lofgren, 1975]. The wetting of collapsible soils has resulted in ground subsidence from the west foothills of the Tehachapi Mountains to northwest of McKittrick (MP 260-326) [Gibbs and Bara, 1966; Bara, 1977]. Blowouts, the localized removal of loose material by strong winds, have occurred in the valleys of the Mojave Desert, especially in playa lakes.

Unique Geologic Features. No geologic features of exceptional interest or significance exist along the proposed route. The relatively young, weathered lava flows from Pisgah and Amboy Craters, which the Mojave Mainline passes by, are of some geologic interest, but are not unique in the Mojave Desert [Jennings, 1975]. Troy Lake playa would be crossed between MP 124 and 130. Sand dune deposits occur to the west of the playa.

Volcanism. The Mojave Mainline would cross a lava flow associated with Pisgah Crater near Hector (MP 114). The age of the Pisgah Crater cinder cone has been described as extremely young (a few hundred years), while other somewhat older lava flows may be as old as Late Pleistocene [Norris and Webb, 1976; Rogers, 1967]. The Mojave Mainline would pass north of a lava flow associated with the Amboy Crater (MP 78). Here, age estimates for the major volcanism range from about 6000 years to less than 2000 years [Oakeshott, 1976; Norris and Webb, 1976].

3.1.2.3 Kern Lateral

Geology and Physiography. The Kern Lateral of the Mojave Pipeline Proposal would traverse the eastern side of the extreme southern end of the San Joaquin Valley. The topography of the proposed route varies from a broad, flat valley (MP 0-21) to rolling, highly dissected terrain. Several small alluvial fans would be crossed by the Kern Lateral (MP 21-45). The segment of the proposed route traversing the foothills of the Tehachapi Mountains is underlain by Quaternary and Tertiary sedimentary rocks. The San Joaquin Valley portion of the proposed route is underlain by Quaternary alluvial fan deposits. The hills around Bakersfield, California, through which the route traverses, consist of Quaternary and Tertiary sediments. A more complete geologic/physiographic description of the proposed Kern Lateral is summarized in Table 3.1-5.

Faulting and Seismicity. The southern end of the San Joaquin Valley has experienced major historic seismic activity, including the Fort Tejon earthquake and the Kern County earthquakes (see Section 3.1.2.2 for more information on these events). The proposed Kern Lateral route crosses several Quaternary faults. The locations of these faults are summarized in Table 3.1-7.

Table 3.1-7

ACTIVE AND POTENTIALLY ACTIVE FAULTS, KERN LATERAL

Fault Name	Location	Age of Last Movement	References
White Wolf	MP 8-12	1952	Jennings [1965]; Greensfelder [1974]; Real et al. [1978]
Edison	MP 21-26	Quaternary	Jennings [1975]
Mt. Poso	MP 39	Quaternary	Jennings [1975]; Real et al. [1978]
Pond-Poso Cr	MP 39-44	Quaternary	Jennings [1975]; Real et al. [1978]
Kern Front	MP 43	active creep	Jennings [1975]; Real et al. [1978]

3.1.3 Soil

The distribution of soil mapping units along the proposed route and variations and the characteristics of the individual soils that comprise the soil mapping units are presented in Appendix A-1. This information has been summarized from numerous published and unpublished soil surveys as well as information from land management agencies. The soil characteristics presented in these tables are important to an assessment of soil impacts potentially resulting from pipeline construction, operation and abandonment. Slope, depth class (quantity of material) and texture are important factors in the evaluation of topsoil suitability for use in reclamation. Slope and texture are also important factors for evaluating erosion susceptibility of the potentially affected soils. Summary descriptions of the soils identified along each proposed segment are presented below by geographic region. These regions do not correlate perfectly with physiographic provinces used in the Geology Sections.

3.1.3.1 Mojave Transfer Line

In the Mojave Desert region, the proposed Mojave Transfer Line would traverse deep sandy and very gravelly soils on gently sloping to moderately steep fan terraces and terrace sideslopes. The soils in the Mojave Desert region formed in material derived from a variety of ~~igneous-to-sedimentary~~ rocks, and have often been modified by wind and water. Soil development ranges from little horizon differentiation on surfaces of recent age, to soils with well developed subsoils or hardpans on stable plains and alluvial fans. Some soils are saline and/or alkaline. Surface organic matter content is low in the warm arid environment. Desert pavements may be common. Soil fertility is mostly low.

Water erosion potential is evenly distributed from low on gentle slopes to high on a few steeper side slopes. Wind erosion potential is mostly high on sandy soils with some areas of low potential on gravelly soils. Reclamation potential is mostly poor due to sandy textures and gravels. These data also characterize the compressor station location [SCS, 1979].

3.1.3.2 Mojave Mainline

3.1.3.2.1 Mojave Desert (MP 0-228)

In the Mojave Desert region, the proposed Mojave Mainline would traverse predominantly deep soils on fans, terraces, basins, and plains. Shallow soils are uncommon and occur either on foothills and mountains or on alluvial surfaces underlain by hardpans. Water erosion potential is mostly low. Wind erosion potential is mostly high. Reclamation potential is mostly poor. Sandy textures, salinity, and alkalinity are the primary limiting factors [SCS, 1967, 1979, 1981a, 1982, 1986f].

3.1.3.2.2 Tehachapi Mountains (MP 228-256)

In the Tehachapi Mountains region, the proposed mainline would traverse predominantly deep soils and a lesser amount of intermingled shallow soils on sloping to steep mountainous uplands. Soils in mountain valleys are deep. The soils of the Tehachapi Mountains region formed in material derived from granite and schist, and have often been modified by water. Soil development ranges from little horizon differentiation on surfaces of recent age to soils that have well developed subsoils. Surface organic matter content is moderate to high. Soil fertility ranges from low to moderate. Water erosion potential is mostly moderate in the valleys and high on mountain slopes. Wind erosion is mostly moderate. Reclamation potential is fair to poor on the mountains and is primarily limited by slope and shallow soils. In the valleys, reclamation potential is good to fair and is primarily limited by some areas with steeper slope and stones [SCS, 1967, 1981a, 1986d].

3.1.3.2.3 San Joaquin Valley (MP 256-325)

In the San Joaquin Valley region, the proposed mainline would traverse deep soils in the valley and a small amount of moderately deep soils on hills. The soils of the San Joaquin Valley region formed in material derived from a variety of igneous, metamorphic and sedimentary rocks, and have often been modified by water. Most soils have little horizon development, although a few have well developed subsoils. Some soils are saline and/or alkaline. Surface organic matter content is low to moderate. Soil fertility ranges from low to very high. Water erosion potential is mostly low, with a few areas of high potential on hills. Wind erosion potential is mostly low to moderate. Reclamation potential is mostly fair to good, with slope on a few hilly areas being the primary limiting factor [SCS, 1967, 1981a, 1986d].

3.1.3.3 Kern Lateral

In the San Joaquin Valley, the proposed Kern Lateral would traverse deep soils. Most of the topography is flat with some steep slopes on hills. Water and wind erosion potential is mostly low to moderate. Reclamation potential is mostly fair to good, with some areas having poor potential. Slope and sandy texture are the primary limiting factors [SCS, 1967, 1981a, 1986d].

3.1.3.4 MJ-1 Compressor Station

Soils at the MJ-1 compressor station are deep. The topography is flat. Water and wind erosion potential is low to moderate. Reclamation potential is fair to poor with the limiting factors being the amount of gravel.

3.1.4 Surface Water

The Mojave proposal would cross the Colorado River basin, the Mojave River basin, and the Buena Vista Lake basin. Within the Colorado and Mojave River basins, the proposed Mojave Mainline and Transfer Line traverse areas which are characterized as being primarily arid to semiarid. The predominant flow regime of the streams, with the exception of the Colorado River, is ephemeral to intermittent. When flows do occur in these ephemeral and intermittent channels, they are usually in response to high-intensity and short-duration convective thundershowers. These flows can be very large and frequently take the form of flash floods, covering wide arroyos and washes. Due to high evaporation rates and minimal precipitation, surface water is generally saline.

Within the Tehachapi Mountains portion of the Buena Vista Lake drainage basin, most streams contain intermittent to perennial flow. Precipitation is considerably higher in the Tehachapi Mountains than in the Mojave Desert and a winter snowpack often develops at the higher elevations. Stream flows are often sustained well into the dry summer and fall seasons as base flow. Water quality is generally fair to good in these streams due to the large amount of groundwater inflow.

Table 3.1-8 summarizes the major drainage channels that would be crossed by the Mojave Pipeline Proposal. The information is based on published literature including USGS water resources data, USGS topographic maps, state reports, pipeline company reports, and on-ground and in-air observation.

3.1.4.1 Mojave Transfer Line

The Mojave Transfer Line route would cross approximately 16 ephemeral to intermittent streams over its 16.5 mile length. All of these streams are completely contained in the Colorado River basin. The major drainages that would be crossed include Five-Mile Wash, Warm Spring, and the Sacramento Wash.

3.1.4.2 Mojave Mainline

The proposed Mojave Mainline would cross more than 300 ephemeral to intermittent streams along its 325 mile length within the Mojave River, Colorado River, and Buena Vista Lake basins.

Within the Colorado River basin the only major perennial stream that would be crossed would be the Colorado River. Colorado River flows gauged near Topock (USGS Station 09424000) averaged 12,640 cubic feet per second (cfs) for the water years 1935 through 1982. Maximum discharge for this period was 35,700 cfs on January 29, 1942. The minimum flow for the period was 375 cfs on February 14, 1935. Sensitivity to pipeline construction in terms of channel and sideslope gradients is low.

Within the Colorado and Mojave River basins, most of the streams are dry throughout the year with the exception of periods of high rainfall which occur during the winter or during summer thunderstorms. Within the Mojave River basin the majority of the streams feed into playa lake basins which have no outlet.

The only major intermittent stream that would be crossed in the Mojave River basin would be the Mojave River. The Mojave River would be crossed approximately 18 miles downstream of Barstow, California. Flows gauged at Barstow (USGS Station 10265000) averaged 25.2 cfs for the period from October 1930 through September 1981. The maximum discharge for this period was 64,300 cfs. The Mojave River is dry during portions of most years.

Within the Tehachapi Mountains approximately 30 ephemeral to intermittent channels would be crossed by the mainline including the major drainages itemized in Table 3.1-8. These streams all drain into the Buena Vista Lake basin.

Within the San Joaquin Valley, approximately 70 ephemeral to intermittent streams would be crossed by the mainline including the major drainages in Table 3.1-8. These streams all drain into the Buena Vista Lake basin.

Table 3.1-8
MAJOR DRAINAGE CHANNELS, MOJAVE PIPELINE PROPOSAL

Pipeline Component	Drainage Basin	Drainage Channel	Flow Class 1/	Sensitivity 2/ Side-Slope	Channel Bed	Mile post
Mojave Transfer Line	Colorado River	Fivemile Creek	I	-	-	10.1
		Warm Springs	I	-	-	10.4
		Sacramento Wash	I	-	-	15.1
Mojave Mainline	Colorado River	Colorado River	P	L	L	1.2
	Mojave River	Mojave River	I	L	L	137.8
		Los Angeles Aqueduct	-	-	-	225.9
	Buena Vista Lake	Tehachapi Willow Springs	I	-	-	234.9
		Mendiburu Canyon	I	-	-	235.3
		Blackburn Canyon	I	-	-	236.3
		Antelope Canyon	I	-	-	238.0
		Antelope Canyon	I	-	-	238.5
		Water Canyon	I	-	-	239.2
		Water Canyon	I	-	-	239.5
		Water Canyon	I	-	-	239.7
		Water Canyon	I	-	-	240.0
		Cummings Creek	I	-	-	245.4
		Live Oak Canyon	I	-	-	248.2
		Chanac Creek	I	-	-	249.0-253.4
		Tejon Creek	I	-	-	255.4
		Caprell Creek	I	-	-	258.2
		El Paso Creek	I	-	-	262.0
		California Aqueduct	-	-	-	275.5
		San Emigdio Creek	I	-	-	280.7
		Sandy Creek	I	-	-	297.2
		Broad Creek	I	-	-	304.6
		Buena Vista Creek	I	-	-	308.4
		Salt Creek	I	-	-	322.1
Kern Lateral	Buena Vista	Tejon Creek	I	-	-	5.3
		Comanche Creek	I	-	-	8.1
		Caliente Creek	I	-	-	20.2
		Unnamed Creek	I	-	-	26.0
		Kern River	P	L	L	32.5
		Unnamed Creek	I	-	-	33.9
		Unnamed Creek	I	-	-	36.0
	Tulare Lake Basin	Mon Canyon	I	-	-	38.9
		Poso Creek	P	L	M	39.7-43.0

1/ I = intermittent; P = perennial; - = ditch or canal, artificial flow

2/ Channel Bed Gradient: L = low 0-1% M = moderate 1-3% H = high > 3%
Sideslope (topo. slope): L = low 0-5% M = moderate 5-20% H = high > 20%

The proposed mainline would cross two aqueducts, the Los Angeles Aqueduct west of Mojave, California, and the California Aqueduct west of Mettler, California.

3.1.4.3 Kern Lateral

The Kern Lateral would cross approximately 30 ephemeral to intermittent streams and two perennial streams within the Buena Vista Lake basin and the Tulare Lake basin. Table 3.1-8 lists the major streams that would be crossed by the Kern Lateral.

The two perennial streams include the Kern River and Poso Creek. Flow gauged on the Kern River near Democrat Spring (USGS Station 111925000), which is located 15 miles upstream of the pipeline crossing, averaged 931 cfs for the period from July 1950 to September 1981. The maximum discharge for this period was 40,000 cfs on November 19, 1950. The Kern River is heavily appropriated for crop irrigation and in dry years it is not uncommon for stream flow to be totally diminished due to these uses. Sensitivity to pipeline construction in terms of channel and sideslope gradients is low on the north but high on the south side.

Poso Creek, gauged near Oildale, California (USGS Station 11197800), has an average annual flow of 30.1 cfs, a maximum flow of 6,700 cfs, and a minimum flow of 0.0 cfs. Much of this flow reportedly comes from waste water inflow from Oildale. the pipeline would not actually cross the creek but would parallel the creek on its floodplain for approximately 3.3 miles. The creek is primarily intermittent in the vicinity of the pipeline, however perennial flow may occur in some years. Sensitivity to pipeline construction in terms of channel and sideslope gradients is low.

3.1.5 Groundwater

Along the route of the proposed Mojave Mainline, Mojave Transfer Line, Kern Lateral, and associated facilities, groundwater occurs in both unconsolidated basin-fill deposits and consolidated rocks. The basin fill consists mostly of unconsolidated to semi-consolidated alluvial deposits of sand, gravel, silt and clay that were derived from weathering of the consolidated rocks in the nearby mountains. These basin-fill or alluvial deposits normally reach maximum thicknesses of 1,000 feet [Langer et al., 1984].

The basin fill is typically saturated near the surface in topographically low areas of most valleys and along major perennial and intermittent streams near the pipeline route. See Section 3.1.4 for a discussion of the streams which may have saturated alluvium associated. Depth to water increases toward the adjacent mountains and may be several hundred feet below the surface beneath the upper portion of some alluvial fans. Near the valley bottoms, particularly near playas and the Mojave River, the depth to groundwater is often less than 30 feet [Langer et al., 1984].

Nonetheless, due to the remoteness of the area, groundwater development is negligible from MP 0 through MP 150. From MP 150 to the end of the proposed pipeline, a high degree of groundwater development has occurred. Water obtained from these high-yield wells is used primarily for irrigation, with locally high usage also for industrial and municipal purposes [Bedinger et al., 1984c].

Springs are common in the mountains, issuing primarily from bedding planes within the sedimentary rock (i.e., at contact points where more permeable bedrock such as sandstone overlies less permeable bedrock such as shale). These springs tend to be low yielding (less than 10 gallons per minute) and often do not sustain their flow throughout the year. Most of the low-yielding springs are used locally by livestock and wildlife as a water supply [Langer et al., 1984].

3.1.6 Freshwater Biology

Two major perennial streams, the Colorado River and the Kern River, and one large intermittent stream, the Mojave River, would be crossed by the Mojave Proposal. Numerous small intermittent and ephemeral drainages would also be traversed by the mainline and laterals, including several that drain into Topock Marsh on the Colorado River. At least 24 different species of fish have been recently collected from the Colorado River between Davis Dam and Lake Havasu (Table 3.1-9), the approximate area of the proposed crossing. The most commonly occurring species in the area include channel catfish, striped bass, largemouth bass, bluegill, and carp. Although the flow of the Kern River may be completely depleted at Bakersfield due to upstream water diversions for irrigation during dry years, this stream also supports nongame fish populations and possibly some warm-water game fish [Christansen, 1986].

Aquatic communities in the ephemeral streams that would be crossed by the Mojave Mainline are similar to other intermittent streams of the region and generally contain limited aquatic habitat. Productivity and diversity of these environments are typically inhibited by excessive suspended sediment concentrations, rapidly fluctuating and periodically low stream flows or dry periods, undesirable algal growths, and elevated stream temperatures [Stephenson, 1984].

The Mojave River, though intermittent, does provide some fisheries habitat. After heavy rains sunfish, arroyo chub, largemouth bass, mosquito fish, three-spine stickleback, and white crappie may be present in the Mojave River and other ephemeral habitats [Brown, 1978].

Table 3.1-9

FISH SPECIES OF THE COLORADO RIVER BETWEEN DAVIS DAM AND LAKE HAVASU

Species	Status	Abundance
Threadfin shad	NG	C
Colorado cutthroat	G	R
Rainbow trout	G	C
Brown trout	G	U
Goldfish	NG	U
Carp	NG	C
Roundtail chub	NG	R
Bonytail chub	NG/E	R
Golden shiner	NG	U
Red shiner	NG	U
Razorback sucker	NG/C	U
Black bullhead	G	U
Yellow bullhead	G	U
Channel catfish	G	C
Mosquito fish	NG	C
Striped bass	G	C
Green sunfish	G	C
Bluegill	G	C
Redear sunfish	G	C
Smallmouth bass	G	U
Largemouth bass	G	C
White crappie	G	U
Black crappie	G	C
Mottled sculpin	NG	U

G - game; NG - nongame; NG/E - nongame, federal endangered species; NG/C - nongame, candidate for federal listing; C - common; U - uncommon; R - rare

Sources: Marshall, 1976; Minckely, 1979; USFWS, 1980; BIO/WEST, 1986.

Species of Special Concern. Three federally listed endangered species, the bonytail chub, the Colorado squawfish, and the woundfin and one candidate species, the razorback sucker, occurred at least historically in this area of the Colorado River. At present, the woundfin is found only in the Virgin River above Lake Mead and the Colorado squawfish is extirpated from the lower basin of the Colorado River [USFWS, 1984a]. Sensitive species still potentially present in the area include the bonytail chub and the razorback sucker. Eighty thousand fingerling bonytail chubs were stocked in Lake Mohave, approximately 35 miles upstream of the proposed crossing, in 1982 [USFWS, 1984a]. Marshall [1976] collected occasional razorback suckers from backwaters of the Colorado River in the Topock Division in 1976.

3.1.7 Terrestrial Biology

3.1.7.1 Vegetation

The Mojave Proposal would traverse three geographic regions characterized by a unique set of geological and climatic conditions and which do not perfectly correlate with physiographic provinces presented in the Geology sections. These include the Mojave Desert, Tehachapi Mountains, and the San Joaquin Valley. Vegetation that would be traversed along the various components of the project is highly variable within each region as well as between the regions. As a result, approximately 10 different vegetation community types would be encountered along the pipeline routes. Narrow zones of riparian vegetation may occur within these vegetation types along streams. These communities are named following the list of natural communities authored by the California Department of Fish and Game [1983]. The community type descriptions and mapping are based on published literature including BLM [1984], Cronquist et al. [1972], Barbour and Major [1977], Twisselmann [1967], Cheatham and Haller [1975], and BLM [1980]; as well as on-the-ground and aerial observation. These types are described in Appendix B and their distributions shown in Map I Volume IV. The distribution of these community types along the proposed routes is presented in Table 3.1-10.

Within the large array of community types along the proposed pipeline routes, a similarly large variety of distinct habitats occurs. These habitats may be exploited by plants with very limited distributions and occurrences and are thus considered rare. Appendix C-1 lists the plant species of special concern that occur in areas that would be traversed by the various project components as well as the geographic regions in which they occur. This list includes those species determined to have a reasonable potential of occurring in the vicinity of the pipeline routes, as well as additional species that also have potential of occurring.

Information on plant species of concern was obtained from several sources including the U.S. Fish and Wildlife Service, Bureau of Land Management, state government agencies, native plant societies, and published documents pertaining to these species. Ranges and distributions are known for many of these plants along the proposed routes; however, in order to protect the species, this information is not included in this document at the request of the Federal Energy Regulatory Commission and the U.S. Fish and Wildlife Service. Of particular concern are plant species that are protected by federal and California state law. The plant species of special concern which are protected are listed in Table 3.1-11.

Table 3.1-10

VEGETATION COMMUNITY TYPES, MOJAVE PIPELINE PROPOSAL

Project Component	Geographic Region	Community Type	Milepost
Mojave Transfer Line	Mojave Desert	Mojavean creosote bush scrub	0.0-16.0
		Wetland/riparian	16.0-16.5
Mojave Mainline	Mojave Desert	Mojavean creosote bush scrub	0.0-2.0
		Wetland/riparian	2.0-2.3
		Mojavean creosote bush scrub	2.3-20.1
		Teddybear cholla 1/	20.1-23.0
		Mojavean creosote bush scrub	23.0-128.1
		Stabilized and partially stabilized desert dunes	128.1-130.0
		Agricultural land	130.0-137.0
		Wetland/riparian	137.0-137.2
		Mojavean creosote bush scrub	137.2-149.0
		Joshua tree woodland	149.0-155.8
		Agricultural land (mixed with Mojavean creosote bush scrub)	155.8-162.5
		Agricultural land (mixed with Mojave saltbush) 2/	162.5-169.5
		Mojave saltbush 2/	169.5-194.7
		Joshua tree woodland	194.7-196.9
		Mojave saltbush 2/	196.9-203.0
		Mojavean creosote bush scrub	203.0-222.6
		Joshua tree woodland	222.6-228.0
	Tehachapi Mtns.	Mojavean juniper woodland and scrub	228.0-232.0
		Digger pine-oak woodland	232.0-251.6
		Valley and foothill grassland	251.6-256.0
	San Joaquin Valley	Valley and foothill grassland	256.0-261.7
		Agricultural land	261.7-293.0
		Valley and foothill grassland	293.0-325.0

Table 3.1-10 (continued)

VEGETATION COMMUNITY TYPES, MOJAVE PIPELINE PROPOSAL

Project Component	Geographic Region	Community Type	Milepost
Kern Lateral	San Joaquin Valley	Agricultural land	0.0-5.8
		Valley and foothill grassland	5.8-8.8
		Agricultural land	8.8-25.1
		Valley and foothill grassland	25.1-32.0
		Great valley mixed riparian forest	32.0-32.5
		Valley and foothill grassland	32.5-37.7
		Great Valley mixed riparian forest	37.7-41.0
		Valley and foothill grassland	41.0-45.0

1/ Sacramento/Stepladder Mountains Teddybear Cholla Unusual Plant Assemblage [BLM, 1980].

2/ Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage [BLM,1980].

Table 3.1-11

LEGALLY PROTECTED PLANT SPECIES, MOJAVE PIPELINE PROPOSAL

Species	Status 1/	Mainline	Kern Lateral
Red rock tarweed	CA-R, C1	x	-
Tulare pseudobahia	CA-E, C2	x	x
Striped adobe lily	CA-T, C2	x	x
Bakersfield saltbush	CA-E, C1	x	x
California jewel flower	CA-E, C2	x	x

1/ C1 = Federal candidate, enough data on file to support federal listing; C2 = Federal candidate, insufficient data on file to support federal listing; CA-R = State of California protected rare; CA-E = State of California protected endangered; CA-T = State of California protected threatened

3.1.7.1.1 Mojave Transfer Line

General Vegetation. The Mojave Transfer Line would traverse Mojavean creosote bush scrub and wetland/riparian community types within the Mojave Desert region.

Plant Species of Special Concern. One federal candidate species, the barrel cactus, occurs in the vicinity of the Transfer Line route.

3.1.7.1.2 Mojave Mainline

Mojave Desert (MP 0-228)

General Vegetation. The proposed mainline would traverse Mojavean creosote bush scrub, wetland/riparian, Sacramento/Stepladder Mountains teddybear cholla unusual plant assemblage (UPA) [BLM, 1980], stabilized and partially stabilized desert dunes, agricultural land, Joshua tree woodland, and western Mojave Desert Mojave saltbush UPA [BLM, 1980]. The wetland/riparian types occur at the Colorado and Mojave Rivers as well as in narrow bands along the numerous intermittent channels that would be crossed by the pipeline.

Plant Species of Special Concern. Twelve species of special concern may occur in areas that would be traversed by the Mojave Mainline within this region. Of these species, 11 are federal candidates and 11 are species of special concern to the California Native Plant Society (CNPS). One species of special concern, the red rock tarweed, is California State listed, rare. Red rock tarweed occupies habitat provided by perennial seeps, springs, and streams in the Mojave Desert in the vicinity of Red Rock State Park in California. Two federal candidate species, the Crucifixion thorn and Barstow wooly sunflower, are known to occur within or in close proximity to the proposed ROW.

Tehachapi Mountains (MP 228-256)

General Vegetation. The proposed mainline would traverse Mojavean juniper woodland and scrub (more typical of the Mojave Desert than the Tehachapi Mountains), digger pine-oak woodland, valley and foothill grassland, and wetland/riparian in narrow bands along intermittent streams. Agricultural land may also occur in small units along the route in the vicinity of Cummings Valley.

Plant Species of Special Concern. Seven plant species of special concern may occur along the route within this region. These include federal candidates (five C2 and two C3c) as well as two State of California protected endangered species (California jewel flower and Tulare pseudobahia) and a protected threatened species, striped adobe lily. California jewel flower grows on sandy, nonalkaline soils in the valley and foothill grassland vegetation type. Tulare pseudobahia and the striped adobe lily grow on heavy adobe-clay soils within the valley and foothill grassland, and digger pine-oak woodland vegetation types.

San Joaquin Valley (MP 256-325)

General Vegetation. This portion of the mainline would traverse valley and foothill grassland, agricultural land, and small amounts of wetland/riparian vegetation distributed along intermittent stream channels.

Plant Species of Special Concern. Approximately sixteen plant species of special concern may occur along the mainline within this region including fifteen federal candidates (thirteen C2 and two C1), a rare plant of concern to the CNPS, as well as four State of California protected species. The California endangered species include California jewel flower, Tulare pseudobahia, and Bakersfield saltbush. The threatened species is striped adobe lily. Bakersfield saltbush is confined to alkaline flats of the southern San Joaquin Valley within the valley and foothill grassland vegetation type. Comanche Point layia, a federal candidate species, is known to occur within or in close proximity to the proposed pipeline ROW.

3.1.7.1.3 Kern Lateral

General Vegetation. The Kern Lateral would traverse agricultural land, valley and foothill grassland, and Great Valley mixed riparian forest community (wetland/riparian) types within the San Joaquin Valley.

Plant Species of Special Concern. Approximately sixteen plant species of special concern may occur along the Kern Lateral including fifteen federal candidates (thirteen C2 and two C1), a rare plant of concern to the CNPS, as well as four State of California protected species. The California endangered species include California jewel flower, Tulare pseudobahia, and Bakersfield saltbush, and the threatened species, striped adobe lily. Two federal candidate species, Comanche Point layia and Bakersfield beavertail cactus are known to occur within or in close proximity to the proposed ROW.

3.1.7.2 Wildlife

The pipeline segments would traverse the three geographic regions as discussed for vegetation (Section 3.1.7.1). Within each of those regions are a number of distinct habitat types for wildlife. Many of the common wildlife species found along the proposed Mojave alignment have wide distributions, but are found specifically where their preferred habitat is present.

Wildlife species of high interest to appropriate state and/or federal agencies are discussed for each pipeline route and alternative below. These species include game animals, raptors, and other vertebrates that may be limited in distribution within the region.

Wildlife species of special concern include those listed by the U.S. Fish and Wildlife Service as threatened or endangered, candidates for such listing, state listed species, and BLM sensitive species. They are discussed for each proposed line where appropriate. Table 3.1-12 lists those species of special concern, their status, and the alignment on which they have been identified. Specific milepost locations have not been included to avoid potential harassment of sensitive species and their suitable habitat. A list of all wildlife species described for this proposal is presented in Appendix E-2.

Table 3.1-12

WILDLIFE SPECIES OF SPECIAL CONCERN,
MOJAVE MAINLINE PROPOSAL

Species 1/ /status	Mojave Transfer Line	Mainline	Kern Lateral
Yuma clapper rail/FE,CA-T, AZ-3	x 2/	x	-
Bald eagle/FE,CA-E, AZ-2	x	x	-
Peregrine falcon/FE,CA-E, AZ-3	x	x	-
California condor/FE,CA-E	-	x	x
Ferruginous hawk/FC	-	x	-
Swainson's hawk/FC	-	x	-
Tricolor blackbird/FC			
Mountain plover/FC	-	x	x
Osprey/AZ-3	x	x	-
Mississippi Kite/AZ-3	x	x	-
Great egret/AZ-4	x	x	-
Snowy egret/AZ-4	x	x	-
Black-crowned night heron/AZ-4	x	x	-
Blunt-nosed leopard lizard/ FE,CA-E	-	x	x
Tehachapi slender salamander/FC,CA-E	-	x	-
Desert tortoise/ FC,CA-P,BLM-S,AZ-3	x	x	-
Desert bighorn sheep/BLM-S	-	x	-
San Joaquin kit fox/FE,CA-T	-	x	x
Giant kangaroo rat/FE,CA-E	-	x	-
Tipton kangaroo rat/FC,FPE 3/	-	x	-
Short-nosed kangaroo rat/FC	-	x	-

Table 3.1-12 (continued)

WILDLIFE SPECIES OF SPECIAL CONCERN,
MOJAVE MAINLINE PROPOSAL

Species 1/ /status	Mojave Transfer Line	Mainline	Kern Lateral
San Joaquin pocket mouse/FC	-	x	x
Tehachapi Pocket Mouse/FC	-	x	-
Nelson's antelope squirrel/FC, CA-T	-	x	-
Mohave ground squirrel/ FC, CA-T	-	x	-
Bonytail chub/AZ-2	-	x	-
Razorback sucker/AZ-3	-	x	-
Morrison's blister beetle/FC	-	x	-
Moestan's blister beetle/FC	-	x	-
Molestan's blister beetle/FC	-	x	-
Hopping's blister beetle/FC	-	x	-

1/ FE = Federally listed as endangered; FC = Candidate for federally listing as threatened or endangered; FPE= Federally proposed endangered; CA-E = Listed as endangered by the state of California; CA-T = Listed as threatened by the state of California; CA-P=Protected by the state of California; BLM-S=Bureau of Land Management sensitive species. AZ-2=Arizona Group 2; AZ-3=Arizona Group 3; AZ-4=Arizona Group 4.

2/ Indicates potential presence of this species along a given alignment. Specific locations are not included in order to avoid potential harassment of these species and their suitable habitats.

3/ In the Federal Register (52 FR 26040) dated July 10, 1987, the U.S. Fish and Wildlife Service proposed endangered status for the Tipton kangaroo rat. The comment period for this proposal was extended to November 8, 1987. Subsequently, this species' status may change from "FC" to "FPE".

Wildlife species and habitats along the proposed pipeline and alternatives have been analyzed for a mile-wide corridor which is referred to in this document as the analysis corridor. In addition, information is presented for the specific right-of-way, although it is understood that the proposed ROW has not been ground staked and that deviations to these alignments are possible.

Presence and distribution of wildlife species and habitats have been delineated based on published literature, the data files of federal and state agencies, and on-site surveys conducted during June-August 1986 for species of special concern. At that time, the proposed route was not surveyed or staked and the pipeline route could only be delineated based on 1:24,000 topographic quad sheets. Every attempt was made to accurately translate the mapped route to an actual ground alignment, but exact routing was impossible to follow. As such, this survey could only indicate the presence of targeted species in the immediate vicinity of the proposed alignment.

3.1.7.2.1 Mojave Transfer Line

General Wildlife. The proposed Transfer Line would traverse about 16.5 miles of the Mojave Desert region. Included in this area is some noncharacteristic riparian habitat near Topock Marsh and the Colorado River. Wildlife habitat types are mainly Mojavean creosote bush scrub, tamarisk scrub and rock canyons. Wildlife typical of the habitats associated with this region includes a variety of small rodents, coyote, gray fox, kit fox, bobcat, mule deer, numerous species of passerine birds, Gambel's quail, roadrunner and several species of doves. Most of the species are broadly distributed and occur along the alignment where suitable habitat exists. Because of the proximity of the portions of the proposed alignment to the Colorado River and backwaters, several species of shorebirds, gulls, terns, waterfowl and passerines associated with water frequent the general area of concern. The upland and desert areas also support a large variety of reptiles, including the desert iguana, zebratail lizard, western whiptail, desert horned lizard, sideblotched lizard, coachwhip snake, gopher snake, and a variety of rattlesnakes [MacMahon, 1985]. No designated important game or raptor habitat has been identified along this proposed route.

Wildlife Species of Special Concern. Three federally endangered species potentially occur along this alignment: Yuma clapper rail, bald eagle and peregrine falcon. The Yuma clapper rail breeds primarily in marshes along the Colorado River, including Topock Marsh of the Havasu National Wildlife Refuge. They are present on the breeding grounds during early-April through mid-September [BLM, 1984b], and some breeding birds may be year-long residents [Edelman, 1986].

Bald eagles occur in the area of concern primarily as migrants and winter visitors. The greatest chance of occurrence is along the Colorado River where major prey items such as waterfowl and fish as well as roost areas are common [BLM, 1984b]. At present no roost areas have been identified within the area of concern. Peregrine falcons occur only as migrants along this portion of the Colorado River [BLM, 1984b].

The desert tortoise is listed as a federal candidate and classified by Arizona Game and Fish Department as Category 3. This state listing indicates that concern exists for the species, but not enough biological information is available to take further action. The desert tortoise occurs throughout western Arizona, although populations are patchy and island-like [Schwable, 1986]. They are primarily found in rocky crevices, washes and other broken rocky terrain [Schwable, 1986]. Approximately 40 percent of desert tortoise habitat in Arizona has presently been surveyed, and results indicate that where found populations range from 25-400 per square mile [Schwable, 1986]. Tortoise populations within Arizona have been designated by Arizona Fish and Game as low (<25 tortoise/mi^2), medium (25-50 tortoise/mi^2) and high (>50 tortoise/mi^2) densities [Schwable, 1986]. Most of the currently surveyed populations within the state fall within the medium density class [Schwable, 1986]. All of this proposed alignment crosses potential tortoise habitat; however, no discrete populations have been delineated for the area of concern.

This alignment would traverse approximately four miles of the Havasu National Wildlife Refuge. This refuge provides suitable habitat for many species of wildlife and protection to many federally protected migratory species.

3.1.7.2.2 Mojave Mainline

Mojave Desert Region (MP 0-228)

General Wildlife. Wildlife habitat types include desert scrub communities, Joshua tree woodland, Mojavean juniper woodland, agricultural land and desert dunes. Community types have been previously described in Table 3.1-10. Characteristic wildlife of the region include desert tortoise, desert iguana, western whiptail, zebratail lizard, coachwhip, rattlesnake, black-throated sparrow, verdin, cactus wren, black phoebe, black-tailed gnatcatcher, roadrunner, loggerhead shrike, golden eagle, desert woodrat, desert cottontail, black-tailed jackrabbit, desert bighorn, wild burro, coyote and kit fox [MacMahon, 1985].

The proposed route would cross the Colorado River ~~along~~ on an existing bridge crossing. Several species of shorebirds, gulls, terns, waterfowl and passerines associated with water frequent the general area of concern at this crossing.

Gambel's quail occur throughout the desert scrub habitat of this region. No crucial habitat has been identified along the proposed route.

Golden eagle and prairie falcons nest throughout the Mojave Desert region. At present, no active nests are known to occur along the proposed alignment; however, the potential for nesting does exist wherever appropriate habitat (cliffs and mountains) are available. The BLM [1980] has identified potential golden eagle habitat within the Sacramento, Piute, Old Woman, Marble, Bristol, Cady and Calico Mountains, as well as the Nebo and Fremont Valley area. The proposed route crosses or is within 0.5 miles of these sites.

Wildlife Species of Special Concern. Species of concern located along the proposed Mojave Mainline are noted in Table 3.1-12.

The Yuma clapper rail, a federally endangered, California state threatened and Arizona Group 3 species, breeds in marshes along the Colorado River [BLM, 1984b], and some individuals may be year-long residents within these marshes [Edelman, 1986]. (The proposed alignment traverses suitable habitat about 0.5 mile east of the Colorado River crossing.)

Bald eagles are federally and California state endangered and listed in Group 2 by Arizona. They occur in the area of concern as migrants and winter visitors. The greatest chance of occurrence is along the Colorado River where major prey items such as waterfowl and fish as well as roost areas are common [BLM, 1984b]. At present no roost areas have been identified within the area of concern. Peregrine falcons occur only as migrants along the Colorado River [BLM, 1984b].

The California condor, a federally endangered and California state endangered species, is one of North America's rarest birds. Essential condor habitat extends east from the Tehachapi Mountains into the western edge of the Mojave region [BLM, 1984b]. This open area provides some potential for foraging opportunities on ~~large~~ carrion within areas that ensure easy take-offs and approaches.

The Mohave ground squirrel is listed as a threatened species by the State of California and as a federal candidate. Its distribution is limited to the desert scrub habitat of the western Mojave desert of California, particularly the creosote bush scrub and saltbush scrub communities. The proposed route would cross approximately 60 miles of this habitat. Ground surveys in June-July 1986 confirmed the presence of Mohave ground squirrels along this alignment.

The Gila monster is a federal candidate believed to be rare in California [BLM, 1985b]. No concentrations or sensitive habitat sites have been delineated along the proposed route.

The desert tortoise is listed as a federal candidate, a California BLM sensitive species, an Arizona Group 3 species, and is fully protected by the State of California under Sections 5000-5002 of the California Fish and Game Code 1983. Tortoise populations and habitat sites have been identified through Berry [1984] for California. Because the tortoise and its habitat is sensitive to harassment, exact locations of these sites are not provided in this document. Tortoises occur throughout the Mojave ~~Province~~ Desert primarily in creosote bush scrub and Joshua tree woodlands at lower elevations [BLM, 1985b]. Though populations occur throughout the desert, they are scattered and vary in density according to local habitat conditions. In California, the proposed ROW crosses 40 miles of high density habitat (100-250 tortoise/mi^2), 29 miles of moderate density habitat (50-100 tortoise/mi^2) and 40 miles of low density habitat (20-50 tortoise/mi^2). Besides these identified concentration sites, the desert tortoise may occur anywhere along the proposed route within this region.

The desert bighorn sheep is a California BLM sensitive species that occurs in much of the mountainous terrain within the vicinity of the proposed route in eastern California. The proposed route would cross approximately two miles of desert bighorn habitat in the Chemehuevi Mountains [BLM, 1980]. The proposed route would also cross two identified migration corridors: one between the Chemehuevi and Sacramento Mountains, the other between the Piute and Old Woman Mountains [BLM, 1980].

Swainson's hawks (federal candidate and California threatened) are rare summer breeders in the Mojave Desert region [BLM, 1985b]. At present, no active nests are known to exist along the proposed route. The ferruginous hawk, a federal candidate, does not breed within the area of concern [BLM,1985b]. Both species may occur as migrants or winter visitors.

The yellow-billed cuckoo is a federal candidate and a California threatened species. It is a resident of dense riparian habitat, and consequently only occurs in the area as a rare migrant [BLM, 1985b].

Tehachapi Mountain Region (MP 228-256)

General Wildlife. The proposed route would traverse Mojavean juniper woodland and scrub, and digger pine-oak woodlands. Small game in the vicinity includes rabbit, California quail, mountain quail, chukar partridge, ring-necked pheasant and possibly Merriam's turkey. Mule deer are the primary big game species. Raptors potentially occurring along the route include the red-tailed hawk, Cooper's hawk, sharp-shinned hawk, great-horned owl, and pygmy owl. It is not presently known if the proposed pipeline encroaches upon any active raptor nests.

Wildlife Species of Special Concern. The two, perhaps three, California condors remaining in the wild as of September 1986 use habitat crossed by the proposed route through the Tehachapi Mountains. This range is considered essential condor habitat [BLM, 1984b]. Dead conifers provide sites for roosting and perching. In addition, the proposed route comes within 0.5 mile of the northern edge of condor critical habitat at Tejon Ranch. No known roost or nest sites occur within the analysis corridor [BLM, 1984b].

The federally listed endangered and California state threatened San Joaquin kit fox may occur along the proposed pipeline within the western foothills of this region; however, given the lack of recent sightings, this area is considered marginal habitat for kit fox [BLM, 1984b].

The Tehachapi slender salamander, a California state threatened species, may exist along north-facing slopes within moist canyons and ravines in oak-pine woodlands, and are frequently found under rotting logs and accumulated leaf litter [SCRA et al., 1980]. The proposed pipeline traverses approximately 1.5 miles of suitable habitat for this species.

Federal candidate species potentially present on this portion of the proposed line include ferruginous hawk, Swainson's hawk, mountain plover, Tehachapi pocket mouse, and Morrison's, Moestan's, Moleston's and Hopping's blister beetles. The ferruginous and Swainson's hawks and the mountain plover occur as migrants. The Tehachapi pocket mouse may be found on the lower western foothills. The four species of blister beetles also occur in the western foothills of the Tehachapi Mountains.

San Joaquin Valley Region (MP 256-325)

General Wildlife. The proposed pipeline traverses the valley and foothill grassland community, and agricultural land. Small game species in the vicinity include cottontail rabbit, black-tailed jackrabbit, California quail, chukar partridge and ring-necked pheasant. No significant general wildlife habitat is defined within the analysis corridor for this geographic region.

Raptors potentially nesting in the area include white-tailed kite, red-tailed hawk, Swainson's hawk, northern harrier, prairie falcon, kestrel, screech owl, short-eared owl and burrowing owl [Small, 1974]. It is not known if the proposed pipeline encroaches upon any active nesting sites but much of the open valley is used for hunting.

Wildlife Species of Special Concern. The proposed pipeline would traverse the range of the California condor. The two, perhaps three, California condors remaining in the wild as of September 1986 potentially use habitat crossed by the proposed route for foraging. This range is considered essential condor habitat

[BLM, 1984b]. Open grassland areas with the potential for large dead animals such as cattle and sheep provide foraging opportunities within areas that ensure easy take-offs and approaches.

The blunt-nosed leopard lizard, a federally and California state endangered species, occurs along this alignment on the western side of the San Joaquin Valley. This species prefers ecotonal areas of grasses interspersed with shrubby vegetation, and occurs on flat terrain and low foothills with soils suitable for rodent burrowing [BLM, 1984b]. They do not occur in croplands. Approximately 33 miles of this proposed line traverses such suitable habitat from the vicinity of the California Aqueduct to the terminus west of the South Belridge Oil Field. Ground surveys conducted during June-July 1986 identified five populations with a total of 13 individuals along the proposed route within suitable habitat.

This proposed route traverses the only portion of the San Joaquin Valley floor in which the San Joaquin kit fox still occurs in substantial numbers; this is due to the relatively large extent of natural vegetation still present. Ground surveys during June-July 1986 indicate suitable habitat is present along this proposed route from the vicinity of the California Aqueduct to the terminus west of the South Belridge Oil Field (approximately 34 miles). One active natal den and 55 diurnal dens were observed in close proximity to the proposed route, and kit fox were seen nightly during spotlighting routes along this segment of the alignment.

The giant kangaroo rat, a federal ~~proposed~~ and California state listed endangered species, prefers relatively flat grassy terrain with fine sandy soils. The giant kangaroo rat is intolerant of agricultural activities and disappears rapidly following cultivation [Williams, 1980]. This species occurs throughout the western side of the San Joaquin Valley on the relatively flat valley floors [Williams, 1980]. Ground surveys during June-July 1986 identified 15 active colonies in the vicinity of the proposed pipeline between the California Aqueduct and the terminus of the proposed route. The proposed alignment would cross approximately 25 miles of suitable giant kangaroo habitat.

The short-nosed kangaroo rat, a federal candidate species, prefers upland saltbush communities in the foothills and higher valleys on the south and west margins of the Tulare Basin [Williams, 1985]. They range from the western foothills east to the California Aqueduct [Williams, 1985]. As such the final 34 miles of this proposed route traverses potential suitable habitat. Ground surveys during June-July 1986 did not identify any active burrow systems within the vicinity of the proposed alignment within this area.

Suitable habitat for the Tipton kangaroo rat is limited along this alignment. Approximately two miles of this alignment has been described by Williams [1985] as potentially supporting this species.

The Nelson's antelope squirrel is a federal candidate for listing and a California state threatened species. This species is associated with moderate stands of Atriplex polycarpa on the west side of the San Joaquin Valley [Williams 1980]. Burrows are frequently dug in banks of arroyos, road cuts, and along pipelines and drilling platforms [Williams, 1980]. The proposed route would traverse approximately 34 miles of Nelson's antelope squirrel range from the vicinity of the California Aqueduct north to its terminus. Ground surveys during June-July 1986 recorded 23 squirrels along this segment of the proposed route.

Ferruginous hawk, Swainson's hawk, tricolor blackbird, and San Joaquin pocket mouse potentially occur along this alignment. Swainson's and ferruginous hawks occur only as migrants or winter visitors. The tricolor blackbird nests in cattails and tules, and feeds in open fields. The San Joaquin pocket mouse occurs in weedy or grassy areas with fine soils.

3.1.7.2.3 Kern Lateral

General Wildlife. The characteristic wildlife species found along the Kern Lateral are generally the same as those described for the proposed Mojave Mainline within the San Joaquin Valley region.

Wildlife Species of Special Concern. The few remaining California condors potentially utilize the limited open grasslands traversed by this proposed route for foraging.

Suitable San Joaquin kit fox habitat occurs along approximately ten miles of this alignment south of Bakersfield, California. This area consists of atriplex/grasslands. Ground surveys conducted during June-July 1986 confirmed the presence of kit fox in this general area. One active natal den and 16 diurnal dens were observed in close proximity to the proposed route, and kit fox were seen nightly during spotlighting routes along this segment of the alignment. Kit fox may also occur along the proposed route north of the Kern River in the oil lease area of Oildale; however, the high amount of human activity and densely packed oil extraction facilities may limit their abundance.

Blunt-nosed leopard lizard suitable habitat is limited to approximately ten miles along this alignment south of the Kern River. Ground surveys during June-July 1986 identified two populations along this proposed route and located an additional population approximately 0.2 mile from this alignment.

Federal candidate species potentially occurring include ferruginous hawk, Swainson's hawk, tricolor blackbird, San Joaquin pocket mouse, and Tipton's kangaroo rat. Swainson's and ferruginous hawks occur only as migrants or winter visitors. The tricolor blackbird nests in cattails and tules, and feeds in open fields. The San Joaquin pocket mouse occurs in weedy or grassy areas with fine soils. No suitable habitat has been identified for the Tipton kangaroo rat along this proposed alignment [Williams 1985].

3.1.7.3 Grazing

The proposed Mojave pipeline would traverse a wide array of grazing allotments with federal, state, and private ownership. Detailed information on grazing allotments along the proposed route may be found in Appendix D-1. Since state lands are often grazed in conjunction with adjacent private lands and stocking rates are often nonownership specific, grazing information on state lands has not been included in this table.

The majority of the land available for livestock grazing along the proposed Mojave Transfer Line (15 miles) is managed by the BLM for wildlife. The remaining two miles would traverse private and ungrazed BLM land.

The Mojave Mainline would intersect six livestock grazing allotments varying from 640 to 451,617 acres. The majority of these allotments are ephemeral range and are grazed only when adequate forage exists. Two allotments are located west of Bakersfield, California, while the remaining four are scattered along U.S. Highway 58. Cattle and sheep are the predominant livestock on these allotments.

The Kern Lateral would not intersect any public grazing allotments.

3.1.8 Socioeconomics

The study area includes 26 counties in six states: five in Arizona, two in California, six in Colorado, eight in New Mexico, one in Texas, two in Utah, and two in Wyoming. The major emphasis in terms of the regional unit for which data are presented is the county. In the case of some of the counties, data are presented for cities or towns that are within 50 miles of a proposed pipeline route and hence may be disproportionately affected relative to the rest of the county. Only cities with 2,500 or more inhabitants are considered due to data availability. Emphasis is also placed on those counties that have relatively greater amounts of project construction or are likely to serve as either supply or workforce bases for the construction workers. There is little reason to provide in-depth profiles of counties in which very little activity is going to take place or which do not have the economic infrastructure to serve as a supply or workforce base.

To avoid unnecessary repetition, the 26 counties and the affected cities that constitute the affected environments for all four pipeline proposals and alternatives are profiled in three tables. These tables are referenced throughout the entire volume, but are presented only once. Table 3.1-13 presents the population and housing characteristics of each of the 26 counties. Table 3.1-14 describes the economic characteristics of the 26 counties. The third table, Table 3.1-15, presents data for selected cities along the pipeline routes and includes many of the data elements for each city that were presented for each county in the previous two tables.

3.1.8.1 Population, Housing, and Economic Characteristics

3.1.8.1.1 Arizona

Mohave County has an area of 13,285 square miles and in 1980 had a population of 55,865 people. By 1984, the population had grown to 68,700 people (see Table 3.1-13). The population of Mohave County is 15.3 percent over 64 years of age and 26.1 percent below 18, indicating that 58.6 percent are in the age group that generally constitute the workforce.

There are 28,000 housing units available in the county and a vacancy rate of 28.5 percent. There are 5,003 hotel and motel rooms near the ROW as well as other temporary housing accommodations in the county. Permanent housing units include houses and apartments, while temporary units are hotel and motel rooms, efficiencies rented by hotels or motels, and RV/campsites. In 1980 there were 7,228 permanent housing units available for temporary or permanent inmigrants to Mohave County.

Employment in the county was 21,519 in December of 1985 and is distributed as follows among the major industry types: 16.58 percent manufacturing, 35.00 percent wholesale and retail trade, 24.20 percent services, and ~~near 0 percent agriculture~~ 13.22 percent in the agriculture, mining, and unclassified categories. Unemployment in the county was 11.1 percent in December 1985 and had increased from an average of 8.4 percent in 1984. Per capita personal income was $8,575 in 1983 dollars and total personal income was $548.8 million of which $203.5 million was in wages and salaries.

The major cities in Mohave County likely to be affected by the proposed projects are Lake Havasu City and Kingman. The 1980 and 1985 populations of these cities totaled 25,166 and 28,315, respectively. There are 3,130 temporary accommodations in the cities. The cities have existing public infrastructures that meet the needs of their present populations and any expected growth, given the existing levels of growth.

3.1.8.1.2 California

Two California counties are in the study area: Kern and San Bernardino. Kern County is the endpoint for the gas brought in by the proposed pipelines to augment existing production capability. In addition, Bakersfield in Kern County has a considerable existing infrastructure of oil and gas development industry and services.

Based on land area, San Bernardino County is the largest county in California with 20,064 square miles. The 1980 Census reported a population of 895,016 people in San Bernardino County which grew to 1,033,700 people by 1984. Approximately 59.8 percent of the population is of working age. The county has 366,136 permanent housing units available; a vacancy rate of 15.7 percent exists. Approximately 2,630 hotel and motel rooms are located within 50 miles of the pipeline, most of which are in the Barstow/Victorville area. Vacancy rates for the accommodations in the Barstow area average 50 percent.

San Bernardino County has a fairly strong economy concentrated in trade and services. The total employment in the county was 366,827 in December 1985. Around 0.56 percent is concentrated in agriculture. A major industry in the county is manufacturing with 16.57 percent of the employment. Unemployment in San Bernardino County averaged 8.0 percent in 1984 and declined to 5.9 percent by December 1985. Per capita income was $10,723 in 1983 and total personal income was $10,695.2 million in 1983 of which $4,873.4 million was wages and salaries.

Adequate services generally prevail in areas where population is prevalent. Due to the large size of the county and the relatively small population size in many areas, public service levels are close to nil in many areas. Major population changes in those areas would necessitate capital investments to create and/or augment public services.

The major cities in San Bernardino County that are near the proposed pipeline are Barstow and Victorville with combined 1980 populations of 31,910. The town of Needles may also be affected by the proposed pipelines. Needles had a 1980 population of 4,120. Barstow, Victorville, and Needles are profiled in Table 3.1-15.

Kern County has a land area of 8,130 square miles. The 1980 Census of the county reported that 403,089 people lived in Kern County. By 1984, that number had grown to 462,400 people. Approximately 59.4 percent of the population are of working age, or between 18 and 65. A total of 154,321 housing units are available to permanent Kern County residents and a vacancy rate of 9.4 percent prevails. Approximately 3,253 hotel rooms are within 50 miles of the proposed pipeline routes.

Table 3.1-13

POPULATION AND HOUSING CHARACTERISTICS OF AFFECTED COUNTIES, MOJAVE, EL DORADO, EL PASO AND TRANSWESTERN PROPOSALS

State/County	Land Area (Sq. miles)	Population 1980	Population 1984	Population Percent Increase	Percent of Population by Age 0-17	Percent of Population by Age 18-64	Percent of Population by Age 65+
ARIZONA							
Apache	11,211	52,108	53,200	2.2	44.7	49.9	5.4
Coconino	18,608	75,008	83,400	11.2	33.1	62.2	4.7
Mohave	13,285	55,865	68,700	22.9	26.1	58.6	15.3
Navajo	9,955	67,629	71,200	5.3	42.0	52.0	6.0
Yavapai	8,123	68,145	78,600	15.4	24.2	56.2	19.6
CALFORNIA							
Kern	8,130	403,089	462,400	14.7	30.9	59.4	9.7
San Bernardino	20,064	895,016	1,033,700	15.5	30.2	59.8	10.0
COLORADO							
Dolores	1,064	1,658	1,800	6.5	31.3	58.3	10.4
Garfield	2,952	22,514	27,400	21.8	28.2	62.9	8.9
La Plata	1,692	27,195	30,800	13.4	26.5	64.9	8.6
Mesa	3,309	81,530	95,300	16.9	28.8	60.5	10.7
Montezuma	2,038	16,510	19,300	17.0	32.8	57.4	9.8
Rio Blanco	3,222	6,255	6,800	9.1	31.6	61.7	6.7
NEW MEXICO							
Eddy	4,184	47,855	53,900	12.6	31.7	55.8	12.5
Lea	4,389	55,993	65,700	17.3	34.1	57.9	8.0
Lincoln	4,832	10,997	13,600	23.2	28.5	59.3	12.2
McKinley	5,442	56,536	61,400	8.6	41.8	53.3	4.9
San Juan	5,521	81,433	95,600	17.4	37.6	56.6	5.8
Socorro	6,625	12,566	14,500	15.7	33.5	57.7	8.8
Torrance	3,335	7,491	8,200	9.8	32.8	55.2	12.0
Valencia (Includes Cibola)	5,616	61,115	37,300	21.4	36.2	56.4	7.4
TEXAS							
Ward	836	13,976	16,000	14.4	34.0	56.7	9.3
UTAH							
Grand	3,689	8,241	8,000	(2.7)	35.4	58.0	6.6
San Juan	7,725	12,253	12,200	(0.8)	47.4	47.5	5.1
WYOMING							
Lincoln	4,070	12,177	14,600	19.8	38.4	53.4	8.2
Sweetwater	10,352	41,723	45,000	7.8	34.3	60.7	5.0

SOURCES:

Land Area, Percent Population by Age, Households: County and City Data Book, 1983, 10th Edition, U.S. Department of Commerce, Bureau of the Census. Population, Percent Increase in Population: Current Population Reports, Local Population Estimates, 1985, U.S. Department of Commerce, Bureau of the Census.

Table 3.1-13 (continued)

POPULATION AND HOUSING CHARACTERISTICS OF AFFECTED COUNTIES, MOJAVE, EL DORADO, EL PASO AND TRANSWESTERN PROPOSALS

	Permanent Housing 1980							1985-1986 Temporary Housing	
State/County	Total Year Round Units	Single Units	Units in Multiple Unit Structures	% Year Round Units Vacant	Vacant Housing Units	Units For Rent	% Rental Vacancy	Hotel/Motel 1/ Rooms	RV 1/ Spaces
ARIZONA									
Apache	15,454	9,952	5,502	18.2	2,816	492	10.1	56	0
Coconino	26,241	15,666	10,575	16.6	4,351	931	9.8	1,450	1,659
Mohave	28,338	14,622	13,716	25.5	7,228	811	14.3	3,150	1,442
Navajo	22,967	14,860	8,107	20.3	4,666	646	11.2	1,296	275
Yavapai	31,682	21,766	9,919	16.0	5,083	838	10.8	186	232
CALIFORNIA									
Kern	154,321	109,105	45,216	9.4	14,510	4,478	7.6	3,253	553
San Bernardino	366,136	277,531	88,605	15.7	57,493	9,933	9.2	2,630	1,234
COLORADO									
Dolores	864	723	141	32.4	280	17	12.8	22	0
Garfield	9,208	5,387	3,821	11.7	1,077	308	9.7	1300	414
La Plata	10,900	6,987	3,913	10.6	1,154	234	6.9	4,178	1,390
Mesa	32,265	22,069	10,196	8.0	2,597	840	9.2	2,000	364
Montezuma	6,287	4,564	1,723	10.0	626	125	8.8	700	163
Rio Blanco	2,405	1,611	794	12.5	129	16	11.0	190	216
NEW MEXICO									
Eddy	18,014	13,619	4,395	7.5	1,345	451	8.9	1,411	293
Lea	21,003	16,214	4,789	9.8	2,056	761	12.4	635	48
Lincoln	6,927	4,766	2,161	40.7	2,819	326	22.6	0	76
McKinley	17,059	11,105	5,954	11.6	1,981	343	5.7	1,600	505
San Juan	28,380	16,574	11,806	11.8	3,360	1,176	15.3	1,200	396
Socorro	4,582	2,969	1,613	12.1	556	131	10.5	360	100
Torrance	3,180	2,207	973	16.8	535	110	18.7	0	108
Valencia (Includes Cibola)	21,862	13,861	8,001	12.6	2,749	760	17.4	1,084	75
TEXAS									
Ward	5,246	4,087	1,159	9.2	481	116	9.7	225	46
UTAH									
Grand	3,003	1,634	1,369	8.1	224	75	10.8	981	311
San Juan	3,409	2,339	1,070	11.5	391	95	11.2	268	77
WYOMING									
Lincoln	4,321	3,102	1,219	10.7	462	133	13.9	278	0
Uinta	4,428	2,400	2,028	7.9	348	139	12.1	1,351	94

1/ Near ROW and selected cities.

SOURCES:
Total Year Round Units, Single Units, Units in Multiple Unit Structures, Year Round Units Vacant: County and City Data Book, 1983, 10th Edition, U.S. of Commerce, Bureau of the Census. Vacant Housing Units, Units for Rent, Rental Vacancy Rates: General Housing Characteristics, 1980 Census of Housing, U.S. Department of Commerce, Bureau of the Census. Hotel, Motel Rooms, Temporary Housing Vacancy: Various personal communications with Chambers of Commerce, City and County Planners, and state offices of tourism RV Spaces: Trailer Life, 1985 RV Campground & Services Directory.

Table 3.1-14

INDUSTRIAL STRUCTURE AND SALIENT ECONOMIC CHARACTERISTICS, MOJAVE, EL DORADO, EL PASO AND TRANSWESTERN PROPOSALS

	Total Employment		Percent Employment by Industry 1983/1984 1/					Percent Unemployment	
State/County	1984 Average	December 1985	Agriculture	Manufacturing	Trade	Mining	Services	1984 Average	Dec. 1985
ARIZONA									
Apache	14,123	12,977	A	12.03	23.44	0.82	40.69	11.5	18.4
Coconino	33,670	33,523	B	12.06	40.12	C	30.35	7.2	11.3
Mohave	21,023	21,519	B	16.58	35.00	C	24.20	8.4	11.1
Navajo	22,962	21,853	B	12.50	32.63	F	18.78	9.9	15.4
Yavapai	30,661	31,292	0.60	13.56	32.17	E	27.98	6.8	6.9
CALIFORNIA									
Kern	190,230	200,932	1.84	8.11	30.97	9.49	24.39	12.2	10.6
San Bernardino	349,458	366,827	0.56	16.57	34.37	0.94	28.43	8.0	5.9
COLORADO									
Dolores	770	758	0.00	A	C	A	A	6.0	5.9
Garfield	13,717	13,476	0.54	4.17	35.12	F	6.15	10.0	7.6
La Plata	15,986	15,922	0.26	5.01	37.33	0.35	36.34	6.8	7.1
Mesa	39,221	39,057	0.59	10.30	35.52	3.28	28.51	11.3	9.7
Montzuma	7,727	7,500	A	8.53	36.89	5.41	16.55	11.2	12.1
Rio Blanco	3,120	3,062	A	1.89	18.64	52.83	7.81	7.7	4.8
NEW MEXICO									
Eddy	21,249	20,381	B	6.55	28.10	23.03	21.95	9.0	13.1
Lea	29,770	29,484	0.15	5.08	29.69	22.59	18.30	4.4	4.9
Lincoln	7,972	7,779	A	4.06	37.63	A	24.84	4.1	6.5
McKinley	15,470	14,946	A	9.90	42.48	9.79	25.83	10.4	13.8
San Juan	32,585	33,091	B	4.32	29.31	13.59	17.67	12.0	11.8
Socorro	4,487	4,680	A	10.83	29.56	2.67	35.50	7.9	9.6
Torrance	2,102	2,196	A	1.67	52.33	0.00	8.00	8.4	15.0
Valencia (Includes Cibola)	10,495	9,727	B	4.34	34.61	17.18	17.97	8.8	12.4
TEXAS									
Ward	7,132	6,924	A	2.49	27.91	25.91	18.43	3.7	4.4
UTAH									
Grand	2,655	2,823	A	1.28	36.85	31.04	13.66	16.0	13.6
San Juan	3,625	3,627	0.00	11.25	38.62	8.68	29.05	10.7	8.3
WYOMING									
Lincoln	5,597	6,221	A	11.59	27.86	F	14.86	9.8	9.6
Sweetwater	19,066	19,354	A	2.86	25.55	33.78	17.02	6.3	8.1

1/ A = 0 - 19 employees; B = 20 - 99 employees; C = 100 - 249 employees; E = 250 - 499 employees; and F = 500 - 999 employees

SOURCES:
Total Employment, Percent Unemployed: Local Area Unemployment Statistics, 1/84-12/85, U.S. Department of Labor, Bureau of Labor Statistics
Percent Employed by Industry: County Business Patterns, 1983-CA,TX,WY,US; 1984-AZ,CO,NV,NM; U.S. Department of Commerce, Bureau of Census

Table 3.1-14 (continued)

INDUSTRIAL STRUCTURE AND SALIENT ECONOMIC CHARACTERISTICS, MOJAVE, EL DORADO, EL PASO AND TRANSWESTERN PROPOSALS

		Measures of 1983 Income		
State/County	1984 Retail Sales (Millions)	Per Capita (Dollars)	Personal (Millions)	Wages and Salaries (Millions)
ARIZONA				
Apache	$ 96.0	$ 5,740	$ 296.3	$ 228.4
Coconino	512.1	8,386	72.3	445.7
Mohave	388.0	8,575	548.8	203.5
Navajo	271.8	7,119	497.2	321.4
Yavapai	391.5	9,868	773.6	265.8
CALIFORNIA				
Kern	2,471.7	10,848	4,847.1	3,040.6
San Bernardino	4,990.8	10,723	10,695.2	4,873.4
COLORADO				
Dolores	4.9	10,156	17.7	5.9
Garfield	240.5	12,456	356.6	208.4
La Plata	209.7	9,285	285.9	144.5
Mesa	723.5	10,205	983.8	561.9
Montezuma	121.3	10,168	191.0	115.1
Rio Blanco	24.3	12,410	88.8	71.9
NEW MEXICO				
Eddy	0.3	10,017	520.0	294.2
Lea	438.7	11,843	715.8	495.2
Lincoln	109.0	9,973	124.4	62.7
McKinley	313.9	5,790	366.3	252.4
San Juan	496.0	8,311	823.0	562.2
Socorro	49.1	6,481	96.4	52.8
Torrance	28.8	6,698	55.1	18.2
Valencia (Includes Cibola)	137.9	8,998	292.5	88.5
TEXAS				
Ward	68.8	10,407	164.9	100.0
UTAH				
Grand	58.3	8,794	71.7	34.4
San Juan	28.1	5,652	70.8	48.6
WYOMING				
Lincoln	82.0	9,998	145.1	91.7
Sweetwater	278.2	12,146	555.9	435.0

SOURCES:
Retail Sales: Sales and Marketing Management, Bill Communications, July 22, 1985 issue.
Income: Local Area Personal Income, Volumes 7,8,9, June 1985, U.S. Department of Commerce, Bureau of Economic Analysis.

Table 3.1-15
SOCIOECONOMIC CHARACTERISTICS OF SELECTED CITIES, MOJAVE, EL DORADO, EL PASO AND TRANSWESTERN PROPOSALS

	Population			Permanent Housing Units 1980		Temporary Housing Units 1985				
State/City	1980	Current	Percent Change	Number	Vacancy Rate %	Motel Rooms	Vacancy Rate %	RV Spaces	1985 Per Capita Personal Income [1]	Employment 1985
ARIZONA										
Flagstaff	34,743	38,247	10	11,319	9.67	2,655	n/a	1,169	$ 9,122	17,665
Holbrook	5,785	5,905	2	1,939	8.41	748	n/a	152	7,913	2,656
Kingman	9,257	10,515	14	3,873	14.82	1,480	n/a	328	10,443	3,982
Lake Havasu City	15,909	17,800	12	7,213	18.91	1,650	n/a	1,114	11,688	8,042
Winslow	7,921	8,215	4	2,862	9.47	547	n/a	23	9,250	3,601
CALIFORNIA										
Bakersfield	105,611	129,686	23	42,761	7.39	2,758	35	264	12,181	54,600
Barstow	17,690	18,824	6	6,717	8.08	1,350	50	238	10,432	9,000
Needles	4,120	5,000	21	1,730	9.83	580	50	440	11,270	1,988 [2]
Victorville	14,220	20,000	41	6,108	12.61	688	n/a	303	9,842	8,340
COLORADO										
Cortez	7,095	8,000	13	2,861	8.67	705	n/a	301	9,897	2,300
Durango	11,426	13,000	14	4,365	5.61	1,393	35	894	10,146	6,720
Grand Junction	28,144	29,000	3	12,706	7.40	2,000	n/a	216	10,360	33,588 [3]
Rangely	n/a	2,512	n/a	n/a	n/a	82	n/a	0	n/a	1,880
NEW MEXICO										
Albuquerque	331,767	525,000	58	132,788	6.59	12,000	65	439	11,025	219,700
Artesia	10,385	13,300	28	4,030	6.67	221	30	11	9,144	4,280
Belen	5,617	7,302	30	2,246	12.60	84	n/a	0	8,116	2,843
Carlsbad	25,496	29,550	16	9,811	6.27	1,190	n/a	282	9,051	22,255
Farmington	31,222	36,000	15	12,009	10.03	1,200	35	61	11,410	14,000
Gallup	18,161	19,853	9	6,481	7.21	1,600	35	311	10,192	n/a
Grants	11,439	14,000	22	3,977	10.61	1,000	n/a	75	10,603	9,026
Hobbs	29,153	37,600	29	11,168	9.48	635	n/a	48	10,739	n/a
Roswell	39,676	45,702	15	16,284	10.84	916	n/a	102	8,987	21,246
Socorro	7,173	9,400	31	2,659	9.59	360	50	100	7,556	n/a
TEXAS										
Monahans	8,397	9,358	11	3,164	7.59	180	n/a	46	9,500	3,847
Pecos	12,855	13,429	4	4,394	10.81	511	n/a	40	7,544	5,997
UTAH										
Moab	5,333	7,050	32	1,991	7.53	491	n/a	311	10,231	2,735
WYOMING										
Evanton	6,421	11,120	73	2,315	7.08	1,255	n/a	22	12,446	9,981
Green River	12,807	13,780	8	4,237	6.07	165	n/a	55	12,612	11,035
Kemmerer	3,273	4,000	22	1,302	11.52	204	n/a	0	13,342	1,951
Rock Springs	19,458	22,000	13	7,515	6.44	1,249	n/a	140	13,847	11,600

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[1] 1979 Per Capita Income adjusted to 1985 dollars with Consumer Price Index; [2] estimate; [3] Entire Mesa County; n/a not available

SOURCES: Population 1984: Various local estimates from county and city planners. Temporary Housing: Various personal communications with Chambers of Commerce, city and county planners, local trade associations, and American Hotel/Motel Association Hotel/Motel Redbook, 99th annual edition. RV Spaces: *Trailer Life*, 1985 RV Campground and Services Directory. Per Capita Income: City and County Data Book, 1983, 10th Edition, U.S. Department of Commerce, Bureau of the Census. Employment: City and County Data Book, 1983, 10th Edition, and various personal communications with local government officials and Chambers of Commerce.

Kern County's industrial strengths relative to other counties are agriculture and petroleum production. Of the 200,932 employed people, 1.84 percent work in agriculture and 9.49 percent in petroleum businesses. The majority of remaining employment is in the service (24.39 percent) and trade (30.97 percent) sectors. Per capita personal income was $10,848 in 1983 and total personal income was $4,847.1 million of which $3,040.6 million was in wages and salaries.

In recent years, unemployment has been a problem in Kern County. The 1984 average unemployment rate was 12.2 percent while the December 1985 rate was 10.6 percent. This problem is most likely greater at this point in time, August 1986, due to further unemployment caused by depressed oil and gas prices.

Public services are provided by many different sources in the county and the supplies of these services are generally adequate. Public service shortages were not apparent in the review of existing data and the compilation of primary information for this project.

The major city that the pipeline project(s) will affect will be Bakersfield. Bakersfield's economy relies on the oil and gas industry and the health of the town is driven in large part by the health of the onshore oil fields scattered around Bakersfield and the oil and gas companies with California headquarters in Bakersfield. Bakersfield had a 1980 population of 105,611 with 54,600 people employed. There are 2,758 motel rooms and other temporary accommodations in Bakersfield/Kern area. The average 1985 occupancy rate was 38.0 percent in the Bakersfield area with an average daily room rate of $41.31 [Pannell, Kerr, Forster, 1985]. Table 3.1-15 provides a detailed profile of Bakersfield.

3.1.8.2 Traffic

The proposed pipeline project(s) will cross many linear transportation and utility corridors throughout their routes. Included in these crossings are major highways, roads, railroad tracks, canals, aqueducts, pipelines, transmission and telephone lines. The categories of crossings in this summary include U.S. Interstates, U.S. Federal highways, state highways, county/local roads, railroads, aqueducts, and major named canals. Data regarding the number and kind of corridors to be crossed by each proposed pipeline are presented in tables within the appropriate texts for each proposal. These data were gathered from state road maps prepared by the American Automobile Association, and BLM 1:100,000 scale surface management status maps.

The roadways crossed by the proposed pipelines are in many cases the same as those adjacent to and used for access by construction, maintenance, and operation personnel. Information regarding the location of staging areas and permanent operation areas will not be provided by individual companies prior to award of

Table 3.1-16

TRANSPORTATION CORRIDOR CROSSINGS, MOJAVE PIPELINE PROPOSAL

Pipeline Component	County, State	U.S. Interstate	U.S. Federal	State	County & Local	Railroads 1/	Aqueducts
Mojave Transfer Line	Mohave, AZ	-	-	AZ 95	1	AT & SF	-
Mainline	Mohave, CA	I-40	-	-	-	UP (5)	-
	San Bernardino, CA	I-40, I-15	U.S.95, 395	-	7	AT&SF(5) UP (1)	-
	Kern, CA	I-5	-	CA 58, 14, 99(2), 33	3	AT&SF (2), SP (2),	LA Aqueduct(2) CA Aqueduct Sunset
Kern Lateral	Kern, CA	-	-	CA 58,178, 223	2	AT&SF/SP	-
Alternative A	Mojave, AZ	-	-	-	2	AT & SF	-
Alternative B							
	San Bernardino, CA	I-15	-	-	4	AT&SF (3)	-
	Kern, CA	-	-	CA 58	1	-	-

1/ AT&SF = Atchison Topeka and Santa Fe
UP = Union Pacific
SP = Southern Pacific

Numbers in parentheses indicate number of crossings the contract to construct the pipeline(s), so this issue is not addressed in this document.

Table 3.1-16 presents major route crossings of the Mojave Mainline, the Transfer Line, Kern Lateral, and the two alternatives.

3.1.8.3 Noise

Reasonable estimates of the general relationship between population density and existing average day-night noise levels (L_{dn}) reported in one study is shown in Table 3.1-17 [National Research Council, 1977].

Table 3.1-17

RELATIONSHIP BETWEEN POPULATION DENSITY
AND AVERAGE DAY-NIGHT NOISE LEVELS,
MOJAVE PIPELINE PROPOSAL

Location	Persons/Sq M	L_{dn} (dBA)
Rural		
Undeveloped	20	35
Partially Developed	60	40
Suburban		
Quiet	200	45
Normal	600	50
Urban		
Normal	2000	55
Noisy	6000	60
Very Noisy	20,000	65

Source: National Research Council [1977]

Noise associated with pipeline construction would only occur during daylight hours and the effects of the increased noise would represent a temporary situation. Pipeline construction activities will proceed at a fairly rapid rate. It is anticipated the pipeline construction activities would be carried out over a period of one year or less with ~~one area in the~~ specific local areas affected by the construction phase for no more than two months.

Except for the area near the proposed MJ-1 compressor station, existing noise levels along the proposed Kern Lateral are the highest on average of any section of the Mojave Pipeline. This is due to the proximity of the route to Bakersfield, California.

Sound levels along the Kern Lateral are estimated to range from approximately 50 to 65 dBA.

A recent sound survey was conducted for the area around the proposed MJ-1 compressor station [Woodward-Clyde, 1985]. Eleven monitoring sites were surveyed. Both day and night sound levels expressed as L_{eq} (dBA) were recorded at each site. Existing noise levels in the vicinity of the proposed Mojave compressor station (dBA) range from an L_{dn} of 41 to 83 dBA. The higher readings were due to the operation of the El Paso Natural Gas Company's existing compressor station at Topock.

3.1.8.4 Recreational Resources

The Mojave Transfer Line parallels the Colorado River; portions of its southern half are in the Havasu National Wildlife Refuge. Within the mile-wide study area are Fivemile Landing, Catfish Paradise and a two mile area of sand dunes which may be of public interest. Fivemile Landing has spaces for campers and mobile homes; Catfish Paradise is for day use only and has a small boat ramp [Dustin, 1986]. Recreational activities generally are limited to those which do not substantially disturb wildlife, particularly waterfowl during their winter and early spring residence. During other months, fishing, boating, and similar activities may take place.

Throughout San Bernardino County the mainline passes through arid desert lands having dispersed recreational resources. From approximately MP 80 to 118 the location of the Johnson Valley-to-Parker leg of the Parker 400 is within 0 to .5 mile of the proposed pipeline route. The Parker 400 is an off-road vehicle race held during the first two weeks of February.

There is a historic era cemetery near MP 142, about 2000 feet south of the proposed ROW and about 1000 feet north of I-40. The town of Yermo is one to two miles west (population 1304 in 1980). The cemetery is presently used for sightseeing, and is associated with Yermo. Five markers at the site date from 1926 through 1943 [Rush, 1986].

The mainline route passes through the Mule Canyon/Calico Dry Lake recreation area between MP 144-147 on BLM and small parcels of private land. Annual visits by recreational users are estimated at 10,000; no facilities are present. It is a popular area for RV's, rockhounds, campers, and sightseers [Rush, 1986].

The Pacific Crest National Scenic Trail is crossed near MP 232 in Cameron/Oak Creek Canyons in Kern County. The scenic trail is a high mountain trail from Oregon to Mexico used by hikers and horsemen. The segment crossed by the proposed pipeline is on private land administered by the BLM.

The proposed route of the mainline passes through the northern portion of Tehachapi Mountain Park near MP 240, southwest of Tehachapi. The park is in steep terrain and has a campground, picnic areas, cabins, and paved roads to facilities [Coyle, 1986].

Between MP 248-251 the proposed mainline route goes through Stallion Springs, a residential complex. Within the mile-wide analysis corridor, there are five park sites, an equestrian center, a golf course, and a lake.

North of Bakersfield the Kern Lateral crosses the westernmost portions of the Kern River County Park. The park has a variety of recreational facilities including a golf course, soccer field, lakes, a zoo for native animals, campgrounds, and picnic areas [Coyle, 1986].

3.1.9 Land Ownership/Use

This section includes two separate but interconnected parts: land use and land ownership. Land ownership is an integral component of land use because in our society land ownership usually determines and controls its use. Determination of land ownership is the first step in discovering the permitted and existing land use.

For the purposes of this study, land ownership is defined as the holder of surface management rights. The governmental entities controlling the land have, in most cases, set certain stipulations regarding the use of the land which vary from agency to agency and subcomponents within the agencies. Indian lands are controlled by the different Indian Nations and Tribes. Since these lands are held communally and are also administered by the Bureau of Indian Affairs, regulations are often complex.

Private ownership is the most difficult of the categories in which to determine the land use. Privately owned lands have the greatest variation in degree of control. In Texas, for instance, a land owner has almost complete control over land use, while privately held parcels of land within the boundaries of an incorporated town are subject to various zoning ordinances and other regulations set by corporate entities. Parcels of private land outside of corporate city limits come under the jurisdiction of the county if the county has published plans or regulations. Private subdivisions must have their plans approved by the county and integrated into the comprehensive plan before they are enforced by county regulations.

State owned lands are administered at a central office charged with seeing that the lands are used for the greatest benefit of the people of the state. Land may be leased, sold, or exchanged as the office sees fit. Since seven states are involved in this study, the rules and regulations vary from state to state and will be discussed in detail for each proposed project.

The Bureau of Land Management (BLM) has guidelines for allowing right-of-way (ROW) leases across specific types of BLM land. For interstate projects, the decision to approve or disapprove ROW grants is on the state office level. Often the BLM has existing designated utility corridors and companies are encouraged to locate proposed facilities within these corridors. If the proposed action is outside of the designated corridor, a document amending the plan must be prepared and approved for these areas prior to construction.

Department of Defense (DOD) lands are administered by the specific agency using the land; decisions are made on that level. These are addressed in the appropriate sections that follow.

The Forest Service (FS) management procedures follow. This is a general discussion which covers all ownership categories used in this document. The decision to approve or disapprove the proposed project will be made by the Regional Forester, who consults with the concerned Forest Supervisors and lead BLM State Director to reach a decision. Conformance or nonconformance with National Forest Land and Resource Management Plans (Forest Plans), as well as adherence to the National Environmental Policy Act and National Forest Management Act will guide decisions. All the Forests crossed by the proposed pipelines have Land and Resource Management Plans supported by Environmental Impact Statements which contain management direction and standards and guidelines for all National Forest lands, including designated utility corridors. If the pipeline company proposes to go through areas not designated as utility corridors, the forest can deny access based on nonconformance with the land and resource management plan, unless the ~~plans-are-Forest-Service-policy~~ plan is amended to permit construction. Amendment of a Forest Plan ~~is a-required-NEPA-analysis~~ requires adherence to the analysis and planning regulations for the National Environmental Policy Act of 1969 and National Forest Management Act of 1976. The EIS/EIR for these proposals may or may not meet these requirements. If it does not, the Forest Service will complete any additional analysis needed to decide whether or not the Forest Plans should be amended. If the decision is not to amend the affected plan, the Forest Service will not concur in the issuance of a ROW grant by the BLM.

The land use categories used in this study are agriculture (irrigated and non-irrigated), rangeland/grazing, forest/timber, commercial/industrial, residential, and other, and are presented in a table titled land use. When there is an area with shared land uses, the category with the highest economic yield will be the category presented, e.g., commercial/residential will be shown as commercial. Agricultural lands are categorized in three ways: that zoned for agriculture, that designated by the Soil Conservation Service (SCS) as prime agricultural land, and land currently in production. Zoned and prime agricultural land need not be in production. Since orchards and vineyards will be taken out of production for the life of the project, they are specifically noted. Other perennial crops such as alfalfa or grasses harvested for hay may recover preproject production levels within one to five years, depending on the crop and the soil quality. Rangeland/grazing is the major use of land for all the proposed routes. Forest/timber land is defined by commercial lumber operation. The land use category commercial/industrial is defined by zoned and/or existing business-related activity. The residential category encompasses a variety of domestic dwellings and associated lands ranging from high rise apartments to ranch estates. It includes, for example, multifamily homes, mobile homes, hogans, outbuildings, and single family homes. The category other includes any uses not identified in the above land uses.

Mojave's proposed Transfer Line, Mainline, Kern Lateral, and Alternatives A and B consist of approximately 481 miles of land crossed in two states: Arizona and California. The lines would traverse one county in Arizona (Mohave) and two in California (San Bernardino and Kern). Table 3.1-18 shows the approximate number of miles crossed in each county and also shows the land ownership status. The land ownership categories are Private (which also includes county and city lands), BLM, State, USFWS, and DOD. The approximate location of lands administered by each of the different entities is shown on the 1:250,000 scale maps in the map volume. The land uses for the proposed Mojave project have been determined by several means: documents authored by the controlling entity, conversation with the land managers, and/or visual siting. Land uses by county are presented in Table 3.1-19. Land use policies and regulations are shown in Table 3.1-20.

The proposed Mojave Transfer Line begins in Mohave County, Arizona, at approximately MP 641.8 of Transwestern's Mainline. It runs in a southerly direction to the proposed Topock compressor station which is approximately one mile east of the village of Topock. The proposed line parallels ~~the existing~~ El Paso Natural Gas Company's (El Paso) existing ROW except for two miles where it parallels Highway 95 to avoid Golden Shores residential development. It passes within 100 feet of a commercial building here. Mojave skirts the boundaries of the Fort Mojave Indian Reservation (FMIR), but a portion of this reservation is within 0.5 mile of the proposed line. The BLM land to approximately MP 10.4 of the Mojave Transfer Line is classified as wildlife habitat with no grazing. The southern portion is rural residential [Gey, 1986] with a small portion zoned commercial. The Transfer Line passes through parts of the Havasu NWR. The land in the area is used by migrating birds and as a breeding ground by the Yuma clapper rails in the spring and early summer. The U.S. Fish and Wildlife Service (USFWS) requires a Special Use Permit/Right of Way to cross the Havasu NWR.

Table 3.1-18

LAND OWNERSHIP, MOJAVE PIPELINE PROPOSAL

Pipeline Component	County, State	Total	Private Miles	Private %	BLM Miles	BLM %	State Miles	State %	DOD Miles	DOD %	USFWS (NWR) Miles	USFWS (NWR) %
Mojave Transfer Line [1]	Mohave, AZ	16.5	0.6	(3)	9.0	(55)	1.7	(10)	-	-	5.2	(32)
Mojave Mainline [1]	Mohave, AZ	1.0	-	-	-	-	-	-	-	-	1.0	(100)
	San Bernardino, CA	189.0	74.2	(39)	113.3	(60)	0.5	(0)	-	-	1.0	(1)
	Kern, CA	135.0	110.4	(82)	10.9	(8)	0.2	(0)	13.5	(10)	-	-
Subtotal		325.0	184.6	[57]	124.2	[38]	0.7	[0]	13.5	[4]	2.0	[1]
Kern Lateral [1]	Kern, CA	45.0	45.0	(100)	-	-	-	-	-	-	-	-
Alternative A [1]	Mohave, AZ	23.0	3.5	(15)	17.7	(78)	1.8	(7)	-	-	-	-
Alternative B [1]	San Bernardino, CA	75.0	46.5	(62)	27.5	(36)	-	-	1.0	(2)	-	-
	Kern, CA	1.0	1.0	(100)	-	-	-	-	-	-	-	-
Subtotal		76.0	47.5	(63)	27.5	(36)	-	-	1.0	(1)	-	-

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[1] BLM 1:100,000 Surface Management Status Maps

BLM = Bureau of Land Management
DOD = Department of Defense
USFWS = U.S. Fish and Wildlife Service
NWR = National Wildlife Refuge

( ) Percentages within county
[ ] Total percentages within loop or line

Table 3.1-19

LAND USE, MOJAVE PIPELINE PROPOSAL

Pipeline Component	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	Grazing/ Rangeland %	Irrigated/ Non-Irrigated Agriculture Miles	Irrigated/ Non-Irrigated Agriculture %	Commercial/ Industrial Miles	Commercial/ Industrial %	Residential Miles	Residential %	Other Miles	Other %
Mojave Transfer Line	Mohave, AZ	16.5	-	-	-	-	1.4	(8)	4.7	(28)	10.4 [1]	(63)
Mainline	Mohave, AZ	1.0	-	-	-	-	-	-	-	-	1.0 [1]	(100)
	San Bernardino, CA	189.0	162.0	(86)	25.0	(1)	2.0	(0)	-	-	-	-
	Kern, CA	135.0	61.0	(45)	50.0	(37)	-	-	10.0	(8)	14.0 [2]	(10)
Subtotal		325.0	223.0	(73)	75.0	(23)	2.0	(1)	10.0	(3)	15.0	(5)
Kern Lateral	Kern, CA	45.0	27.0	(60)	14.0	(31)	-	-	4.0	(9)	-	-
Alternative A	Mohave, AZ	23.0	-	-	-	-	-	-	4.0	(18)	19.0 [1]	(82)
Alternative B	San Bernardino, CA	75.0	24.0	(32)	49.0	(65)	-	-	2.0	(3)	-	-
	Kern, CA	1.0	1.0	(100)	-	-	-	-	-	-	-	-
Subtotal		76.0	25.0	(33)	49.0	(64)	-	-	2.0	(3)	-	-

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[1] wildlife habitat
[2] military uses

Table 3.1-20

FEDERAL, STATE AND COUNTY LAND USE REGULATIONS AND POLICIES, MOJAVE PIPELINE PROPOSAL

Administrative Agency	Document	Policies/Requirements
FEDERAL		
Department of Interior		
Bureau of Land Management		locate in designated utility corridors
Phoenix District	Resource Management Plan	within utility corridor
California District	California Desert Conservation Area Plan	within utility corridors
Bakersfield District	Resource Management Plan	no existing designated corridors
U.S. Fish and Wildlife Service		special use permit and right-of-way permit for Havasu NWR
Department of Defense Edwards Air Force Base	License to Enter and Notice to Proceed Construction Draft Operating Procedures	apply and receive consent
STATE		
Arizona	Official Compilation of Administrative Rules and Regulations, 1977	apply for right-of-way and consent from leasee
California	Certification of Conformance with water quality standards	apply for permit
	Report of Waste Discharge	apply for permit
COUNTY		
Mohave, AZ	Mohave Valley South, 1980	no reference to pipeline regulations
San Bernardino, CA	San Bernardino County, Consolidated General Plan and Implementation System (includes amendments to March 10, 1986)	promote consolidation of new pipelines and existing pipelines...except where there are demonstrated concerns
Kern, CA	Kern County Zoning Ordinance, 1986 Kern County General Plan, 1986	no reference to pipelines
CITY		
Barstow	General Plan Map, Zoning Map	no reference to pipeline
Bakersfield	Land Use and Circulation Map, City Data Book, Title 17 Zoning, 1985	special use permit requirements

Mojave plans to start its westerly route in Mohave County, Arizona, at the proposed MJ-1 Compressor Station adjacent to El Paso's Topock Compressor Station. This is on a 40-acre parcel of private land surrounded by the Havasu NWR on three sides and state land on the ~~other~~ east. The mainline then crosses a little over a mile of Havasu NWR and passes through the unincorporated town of Topock, within 100 feet of three homes. The mainline is proposed to cross the Colorado River on the old U.S. Highway 66 bridge. The bridge was abandoned by the Arizona Department of Transportation to local owners; El Paso Natural Gas Company purchased the bridge and is using it to support pipelines across the river [Bruesch, 1986].

In San Bernardino County, the Mojave Mainline traverses another mile of Havasu NWR. From the NWR the mainline follows a small portion of the BLM Yuma District Utility Corridor No. 3 before entering the BLM California Desert Conservation Area (CDCA). The Chemehuevi Mountains Addition WSA (AZ-050-3) is just south of the line at this point. In the CDCA it follows the designated utility corridors G and H. From the Colorado River to Highway 95 the Chemehuevi Mountains WSA is south of the proposed route.

Proceeding west, the pipeline is still within corridors G and H with the Sacramento Mountains WSA to the north and Stepladder Mountains WSA to the south (MP 18-31). Between MP 32 and 41 the Piute Peak WSA is on the south and Piute Mountains WSA to the north. At approximately MP 40 the pipeline goes into utility corridor H. At about MP 59 the southern tip of Marble Mountains WSA is within 0.5 mile. From MP 70 to 90 north of the route is Lava Hills WSA. The land use (between MP 90-128) is agriculture. The Pisgah Lava Beds Research Natural Area is south of the route but within 0.5 mile for about seven miles around Pisgah. Hectorite, a unique mineral, is mined in this area. The mainline is also out of a corridor between MP 123 to Boron. Much of the land crossed between Pisgah and Yermo (MP 128-142) is privately owned with scattered irrigated agriculture and some homes. The Mojave River is crossed at approximately MP 136. Between MP 144-147 the route passes through the Mule Canyon/ Calico Dry Lake area used for mining and recreation. At approximately MP 160 is a gravel quarry. The area from Barstow to approximately MP 176 does not have very much residential or commercial uses and very little agriculture on the private land. The BLM land has only scattered recreation and wilderness uses [Collins, 1986]. This scattered recreation consists of rock-hounding, sightseeing, painting, photography, and "just poking around" [CDCA, Conservation Area Plan, 1980]. From MP 176 to the county border is an area used for ephemeral grazing. This type of range usually occurs in regions below the 3,500 ft elevation. The annual forage varies yearly so that the type and number of animals allowed to graze also vary.

San Bernardino County participated in the development of the Joint Utilities Management Program (JUMP) prepared in 1976. This document was designed to serve as a policy document for the Board of Supervisors, the Planning Commission, the BLM, the State Energy Commission, other governmental and private agencies and individuals on all major energy-related issues in San Bernardino County. Its major policy statement regarding new pipeline corridors is that they "should be consolidated within existing pipeline or electrical transmission corridors except where there are technical or overload constraints or where there are social, aesthetic, significant economic or other overriding concerns" [JUMP, 1976].

In Kern County the proposed Mojave Mainline returns to the BLM designated utility corridor G west of the unincorporated village of Boron. It is within the northern edge of Edwards Air Force Base from MP 196 to MP 211.2. The route is also within 0.5 mile of the unincorporated town of North Edwards. A BLM parcel of land in this area is leased for residential use but all other BLM land is used for grazing. The proposed pipeline then crosses the Pacific Crest National Scenic Trail at MP 232.4, passes through approximately 0.5 mile of Tehachapi Mountain Park near MP 240, and passes near the small community of Indian John Springs. The mainline passes within 0.5 mile of the California Correctional Institute between MP 244 and 246. Mojave's Mainline would cross the residential development of Stallion Springs from MP 248 to 251. It would pass within 0 to 100 feet of several homes. It then crosses El Tejon Ranch. The principal land use on the ranch is grazing with other commercial and residential uses proposed for future development. Several orchards and vineyards are traversed between MP 259 to 289. It passes within 0.5 mile of the towns of Maricopa and Ford City. The proposed route goes into a checkerboard area with ownerships of Elk Hills Naval Petroleum Reserve (Elk Hills), BLM, and private land. The land use is oil and gas fields with some scattered grazing. Elk Hills uses the guidelines developed by the USFWS for managing its lands.

The proposed Kern Lateral of Mojave is located in Kern County, California, for its entire 45-mile length. All the land is privately owned. The route begins its northerly route at MP 262 of Mojave's Mainline. It skirts the western boundary of El Tejon Ranch only crossing isolated portions of the ranch, and crosses orchards and/or vineyards at MPs 1, 4, 12, 17, and 44. The area from MPs 0 to 13.5 has scattered parcels of SCS designated Prime Farmland and Unique Farmland. It is proposed to cross approximately four miles of land within the boundaries of Bakersfield; this land is zoned R-1, providing the potential for single family residential development. The Kern River County Park is zoned open space. The route crosses approximately 0.5 mile of the westernmost portion of the park. To the northeast of Bakersfield the lateral enters an area that is mostly oil and gas fields with some grazing.

3.1.10 Cultural Resources

3.1.10.1 Archaeology

The cultural resources of the mile-wide corridors which are centered on the proposed routes are presented in two tables which summarize numbers of sites and their National Register status, and data on site types (see Tables 3.1-21 and 3.1-22). The data in these tables reflect the information available as of April 1986. In most instances, only small portions of the pipeline corridors have been the subject of ground surveys performed to BLM standards and as such there are large gaps in the data. In terms of the site location data provided, the most important survey has been the recent Celeron/All American Pipeline intensive survey completed in 1985. The fact that some pipeline segments contain few sites probably reflects the general lack of research in the area. Prior to actual pipeline construction, it will be necessary to conduct intensive on-the-ground surveys to ascertain the full extent of cultural resources present in the actual construction ROWs. Please note that the tables in this section summarize the known cultural resources within the mile-wide corridors. The discussion of those sites which have been determined to be within the proposed projects construction ROWs will be presented in the impact section.

Table 3.1-21

KNOWN CULTURAL RESOURCE SITES, MOJAVE PIPELINE PROPOSAL

Pipeline Segment (State)	Sites and National Register Status [1] Listed on NRHP	 Determined Eligible/ Nominated	 Determined Ineligible	 Undetermined
Mojave Transfer (Arizona)	-	-	-	1
Mojave Mainline (California/AZ)	1	2/0	4 [2]	120
Kern Lateral (California)	-	-	-	1
Total	1	2/0	4 [2]	122

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[1] National Register status here refers only to the results of official determinations. Many other sites may meet the eligibility criteria but they have not been formally evaluated. In addition, three sites are listed as California Historic Landmarks, and two others are listed in the California Inventory of Historic Resources.

[2] This figure includes three sites which have been destroyed.

Table 3.1-22

KNOWN CULTURAL RESOURCE TYPES, MOJAVE PIPELINE PROPOSAL

	Pipeline Segments		
Type	Mojave Transfer Line	Mojave Mainline	Kern Lateral
Campsite	-	3(14)	1
Scatters			
Lithic	(1)	51 (1)	-
Lithic+Groundstone	-	2	-
Fire altered rock	-	1	-
Lithic+Fire a.r.	-	6(1)	-
Lithic+Groundstone+ Fire altered rock	-	1	-
Features			
Bedrock Mortar(s)	-	13	-
Bed. Mortar+Lithics	-	3(1)	-
Hearth(s)	-	1	-
Hearth+Lithics+ Groundstone	-	2	-
Roasting Pit	1	-	-
Rock Alignment	-	4	-
Rockshelter	-	4	-
Petroglyphs	-	1	-
Trail	-	2	-
Intaglio	-	1	-
Isolated Find	-	6	-
Historic Features			
Historic Trash	-	2	-
Historic Dump	-	1(1)	-
Bridge	-	2	-
Burial	-	2	-
Rock Alignment	-	2	-
Historic Structures	-	6	-
Road/Trail/Pass/Crossing	-	4	-
Railroad,RR Grade	-	2	-
Historic Town	-	1	-
Unknown	-	4	-
Total Sites	1	127	1

Figures in parentheses refer to additional instances occurring at sites already counted once in the table.

The tables summarizing and interpreting the cultural resources for the Mojave pipeline project are based on the data presented in some detail in the cultural resources technical report [de Barros, 1987]. Details on previous surveys conducted as well as an overview of the prehistory, history and ethnohistory of the project area are also contained in the technical report. To protect cultural resources from unauthorized collection, this report will be made available only to qualified investigators.

Summary. The Mojave Mainline, Transfer Line, and Kern Lateral represent 387 miles of pipeline. Numerous surveys have been conducted within or partially within the analysis corridor. These surveys have covered approximately 23.75 miles (6.1 percent) of the proposed pipeline construction ROW. Another 24.6 miles of survey have been conducted adjacent to (or perhaps partially covering) the proposed ROW.

There are a total of 129 known cultural resource sites within the mile-wide analysis corridor centered on the proposed Mojave pipeline. These include 103 prehistoric and 22 historic sites. Four are of unknown time period. Nearly 30 of them have been identified by the intensive survey of the All American pipeline ROW completed in 1985. One site, the Topock or Mystic Maze near the Colorado River, is listed on the National Register and is sacred to the local American Indians; ~~another has~~ two others have been determined to be eligible [KER-322, a lithic scatter, and the Needles Bridge (AZ)]. ~~has been nominated to the National Register.~~ One site has been determined ineligible and three others have been destroyed. Three sites are listed as California Historic Landmarks: Oak Creek Pass (CHL #97), a major transportation route through the Tehachapi Mountains; the Fages-Zalvidea Crossing (CHL #291), a plaque commemorating the Spanish explorations of the Southern San Joaquin Valley; and the National Old Spanish Trails Monument (CHL #781), an old Indian trail, still visible in some places, which ran roughly parallel to the Colorado River on the California side. The Needles Bridge and the Red Rock Bridge are listed in the Arizona State SHPO files. The latter has been destroyed.

Two other sites are listed in the California Inventory of Historic Resources: Foley Grave (KER-1615/H), where this early pioneer of the Tehachapi area was buried; and the town of Bagdad in the Mojave Desert.

Site Significance. Aside from the sites which have National Register status, it is not possible at this time to make a formal assessment of the significance of sites found within the analysis corridor. In practice, both CEQA (Appendix K) and NHPA (Section 106) procedures generally require formal subsurface testing in order to properly assess site significance. Since such testing has not been conducted on the vast majority of known sites, it will be assumed that all sites are potentially significant until further investigation proves otherwise. Only sites which have been officially determined to be ineligible for the National

Register or which have been destroyed are viewed as insignificant.

Route Sensitivity Ratings. While an inventory of the known cultural resources provides important data for an assessment of potential impacts (see Chapter 4) it does not provide adequate data for a comparison of route alternatives to their equivalent mainline segments or for comparisons between the various pipeline proposals. This is because in most instances only a small percentage of the proposed construction ROWs have been surveyed for cultural resources (frequently less than 10 to 15 percent) and the percentage surveyed differs in each case. In view of this situation, it is necessary to make an estimate of the potential for cultural resources along the route. Pipeline routes must be evaluated in terms of their sensitivity for cultural resources. Because of incomplete and differential survey data, route comparisons can only be realistically made using such sensitivity ratings.

To accomplish this, pipeline routes were broken into 25-mile segments. (Segments were shorter in cases where proposed routes were less than 25 miles, e.g., the Mojave Transfer Line; and they were sometimes a few miles longer to avoid residual segments of only a few miles.) Each segment was assigned a sensitivity rating of "very high", "high", "moderate", "low", or "uncertain". These ratings were based on four kinds of data: 1) estimated site densities within the analysis corridor as determined from previous survey data, 2) the presence of sites (or districts) with National or State Register status, 3) the crossing of Indian reservation lands, and 4) elementary terrain analysis (e.g., the presence of major water sources). In instances where there was insufficient survey coverage of the analysis corridor to justify making an estimate of site density, a segment was assigned a rating of uncertain. The details of how rating assignments were made are provided in the Cultural Resources Technical Report.

Only "very high" and "high" sensitivity segments were utilized as a basis for the comparison of routes and alternatives (see Volume III). When these occur along a given pipeline route or alternative, this will be indicated. In the case of the Mojave pipeline, there are three high sensitivity pipeline segments situated along the route.

3.1.10.2 American Indian Concerns

In order to document American Indian concerns, a letter explaining the proposed project was sent with route maps to appropriate Indian groups and individuals. The letter specifically requested responses with regard to sacred areas, archaeological sites and their excavation, burials, and ethnographic use areas with particular reference to traditional plants and animals. When groups responded, follow-up telephone or written contacts were made. A copy of the initial letter and the list of those contacted are provided in the cultural resources technical report. In addition, existing published documentation on American Indian concerns was consulted whenever it dealt with the area of the proposed project.

In the case of the Fort Mojave Indian Reservation, parts of the reservation lie within the mile-wide analysis corridor and the Mojave Transfer Line (Arizona) crosses the reservation for about 600 feet. In view of the above, a presentation of the proposed project was made before the tribal council in Needles and informal interviews were conducted with several of its members. The Fort Mojave Indian Reservation also responded in writing to requests for information. They have recently adopted a new resolution which seeks to protect traditional use areas whether they lie within or outside reservation boundaries. Details of this resolution are presented in the technical report. The Mojave Tribe is particularly concerned about protecting ancestral sites of all kinds, including sacred areas and traditional use areas for hunting, fishing, camping and plant collecting. Burials are to be left undisturbed and artifacts uncovered during excavation should be returned to the tribe, particularly if found on reservation land.

Sites which are particularly sacred include archaeological sites, trails and trail shrines, rock art sites, intaglios, burial (cremation) and cemetery sites, and locations associated with myths [Evans,1981:3]. In terms of actual sites, the only area specifically mentioned with regard to the proposed pipeline was the Topock or Mystic Maze which is considered to be very sacred to the Mojave and other Colorado River Indian groups. Such intaglios have been defaced in other areas, particularly by off-road vehicles [Bean and Vane,1978:6-39]. Some concern was also expressed about the pipeline where it crosses the Colorado River Basin since this was part of the traditional homeland of the Mojave and other Colorado River Indian groups [see also Evans, 1981:10]. They also stated that they did not want the pipeline to cross their reservation. The Mojave have expressed concern about many other sites and areas in the past [Evans, 1981], but none of these are located within the mile-wide analysis corridor of the proposed pipeline.

Previous studies have shown the Mojave to be concerned about several varieties of plants used traditionally for food, ceremonies, medicines, and basketry [US Army Corps of Engineers, 1982:46-47]. For the proposed pipeline, particular concern was expressed about the possible destruction of mesquite.

Previous studies among the Chemehuevi and among Mojave and Chemeuheuvi at the Colorado River Indian Reservation [Bean and Vane, 1978] elicited similar concerns with regard to the construction of the Devers-Palo Verde Transmission Line. Most respondents were quite concerned about the preservation of archaeological sites, burial sites, trails and trail shrines, rock art, intaglios and mythically associated locations. A majority were also concerned about endangered plant and animals species as well as inorganic resources such as pottery clay since many are still being used by contemporary Indians. (Details on specific plant species are provided in Bean and Vane [1978:6-37 through 6-39]).

Finally, a representative of American Indians living in the Tehachapi area expressed concerns about ancestral (archaeological) sites and burials in that region.

The American Indian Council of Central California expressed concern about ancestral sites along the Kern River.

3.1.11 Paleontological Resources

Recognized fossil occurrences have been previously recorded within and along the entire length of the one mile wide Mojave corridors. A technical report containing detailed information on the paleontologic resources of the project areas was prepared [Morales et al., 1987]. To protect fossil localities from unauthorized collecting, this report will be made available only to qualified investigators. A summary of the technical report is presented below, beginning with those resources at the eastern end of the respective pipeline routes.

Paleontologic resources within a corridor include: 1) known fossil occurrences (specimens) and localities, 2) the fossil-bearing strata that produced these remains and contain these localities, and 3) deposits with the potential for containing particular types and numbers of fossils.~~; and 4) frequencies of localities within a corridor.~~ Rocks with a high potential for producing fossils are likely to yield comparatively common remains and localities; rocks with a moderate potential are likely to produce comparatively few fossils or localities; rocks with a low potential are likely to contain few or no fossils or localities. The level of paleontologic importance of a geologic unit in a particular area of exposure is based on the known or potential type and frequency of fossil remains and localities in fossiliferous or potentially fossil-bearing rocks.

Identifiable fossil remains are considered highly important if they are 1) vertebrates or 2) non-vertebrates (invertebrates, plants, traces, and microfossils) that are, at a minimum, a) identifiable to class level, b) age diagnostic to period, c) yield important information regarding environment of deposition and/or stratigraphic correlation, d) non-ubiquitous, and e) non-abundant. Because vertebrate remains are comparatively rare in the fossil record, geologic units containing these fossils are considered to be of greater paleontologic importance than those containing similar numbers of invertebrate remains, which are relatively common. Rocks containing relatively few fossils are considered less important than those containing numerous similar fossils, unless 1) the former contain remains representing comparatively rare taxa, or 2) the latter contain abundant ubiquitous invertebrate and/or microfossil remains. Geologic units containing associated vertebrate and invertebrate or plant remains are considered highly important because of the potential for detailed correlation of their respective time scales and paleoecologic reconstruction. Any paleontologic locality, as well as the fossil-bearing rocks occurring at and in the vicinity, is considered highly important if it contains highly important fossil remains, regardless of the overall paleontologic importance of the geologic unit. Fossil-bearing and potentially fossiliferous rocks of the same geologic unit are assigned the same level of importance based on 1) the types and frequencies of fossil occurrences and the density of fossil localities known from the fossiliferous rocks, 2) the implications of these resources regarding the productivity of the potentially fossiliferous rocks, 3) the evaluation by paleontologists working in the area, and 4) the low confidence in available survey data, if any, for a more reliable evaluation.

The paleontologic importance of each geologic unit exposed in the corridors was then assessed based on 1) type, frequency of occurrence, and importance of the remains occurring at each locality, 2) the number of localities recorded for each formation within or near the corridor, and 3) the potential of the formation for yielding comparable numbers of localities and similar remains within the corridor. Criteria for the four levels of paleontologic importance used to evaluate each geologic unit exposed in the study area are given below:

1) High: High to moderate potential for containing vertebrate fossils or highly important non-vertebrate fossils within a corridor because numerous fossils of the same type are known to occur within or near the corridor, and/or in the same geologic unit in other areas.

2) Moderate: Low potential for containing vertebrate fossils or highly important non-vertebrate fossils within a corridor because such fossils are unknown within or near the corridor and rare in the same geologic unit in other areas; High to moderate potential for containing moderately important non-vertebrate fossils within the corridor because such fossils are known to occur abundantly and/or ubiquitously within or near the corridor, and/or in the same geologic unit in other areas.

3) Low: Low potential for containing moderately important non-vertebrate fossils within the corridor because such fossils are unknown or rare within or near the corridor, and/or the same geologic unit in other areas; High to low potential for containing non-vertebrate fossils of low importance.

4) Uncertain: Unknown potential for containing fossils of high, moderate, or low importance because the geologic unit or the

Table 3.1-23

PALEONTOLOGICAL FORMATIONS, MOJAVE PIPELINE PROPOSAL

Age	Formation	Potential 1/ Vertebrate/ Invertebrate	Sensitivity
MOJAVE TRANSFER LINE			
Precambrian	Granite/Geneiss	L/L	No
Quaternary	Basalt	L/L	No
Tertiary/Quaternary	Nonmarine Sedimentary	L/L	No
MOJAVE MAINLINE			
Miocene	Bena gravels	L/L	No
Upper Miocene	Chanac	H/L	Yes
Holocene	Alluvial fan	L/L	No
Pleistocene-Lower Holocene	Dune sand	H/L	Yes
Precambrian-Holocene	Igneous and metamorphic undifferentiated	L/L	No
Middle Miocene	Jackhammer	L/L	No
Lower-Middle Miocene	Miocene nonmarine sedimentary	H/L	Yes
Pennsylvanian	Oro Grande Series	L/H	No
Middle Miocene	Pickhandle Formation	L/L	No
Pleistocene	Nonmarine sedimentary	M/L	No
Pliocene-Pleistocene	Nonmarine sedimentary	L/L	No
Pleistocene-Lower Holocene	Quaternary alluvium and Pleistocene nonmarine sedimentary deposits	H/L	Yes
Pleistocene-Lower Holocene	Quaternary lake deposits	H/L	Yes
Pleistocene-Holocene	Quaternary nonmarine terrace	L/L	No
Tertiary	Nonmarine sedimentary	L/L	No
Pliocene-Lower Pleistocene	Tulare Formation	H/L	Yes
KERN LATERAL			
Miocene	Bena gravels	L/L	No
Upper Miocene	Chanac Formation	H/L	Yes
Holocene	Alluvial fan deposits	L/L	No
Pleistocene-Lower Holocene	Dune sand	L/L	No
Holocene	Stream channel deposits	L/L	No
Precambrian-Holocene	Igneous and metamorphic undifferentiated	L/L	No

Table 3.1-23 (continued)

PALEONTOLOGICAL FORMATIONS, MOJAVE PIPELINE PROPOSAL

Age	Formation	Potential 1/ Vertebrate/ Invertebrate	Sensitivity
KERN LATERAL (continued)			
Uppermost Miocene	Kern River Formation	H/L	Yes
Pleistocene	Nonmarine sedimentary	L/L	No
Pleistocene-Lower Holocene	Quaternary alluvium and Pleistocene nonmarine sedimentary deposits	L/L	No
Pleistocene-Holocene	Quaternary nonmarine terrace deposits	L/L	No
Middle Miocene	Round Mountain silt	H/L	Yes
Upper Miocene	Santa Margarita Formation	H/H	Yes
ALTERNATIVE A			
Precambrian	Granite/Gneiss	L/L	No
Quaternary	Basalt	L/L	No
Tertiary-Quaternary	Nonmarine sedimentary	L/L	No
ALTERNATIVE B			
Pleistocene-Lower Holocene	Holocene dune sand	H/L	Yes
Precambrian-Holocene	Igneous and metamorphic undifferentiated	L/L	No
Middle Miocene	Jackhammer Formation	L/L	No
Pennsylvanian	Oro Grande Series	L/H	No
Middle Miocene	Pickhandle Formation	L/L	No
Pleistocene	Nonmarine sedimentary	M/L	No
Pleistocene-Lower Holocene	Quaternary alluvium and Pleistocene sedimentary deposits	H/L	Yes
Pleistocene-Lower Holocene	Quaternary lake deposits	H/L	Yes

1/ L = Low, M = Moderate, H = High

Source: Morales, et al.[1987]

study area is poorly known, and therefore too few data are available to make an assessment.

These criteria are considered the most amenable for the evaluation and paleontologic sensitivity ranking of particular segments along a corridor, and for comparisons of alternative routes, because they are based on known and potential fossil occurrences in geologic units with previously delineated areas of exposure.

Known and potential paleontologic resources within the corridor are summarized by area and formation in Table 3.1-23. Detailed information regarding these resources is contained in the paleontologic resource assessment report for this project [Morales et al., 1987]. Only formations exposed in the corridor are discussed in this table.

3.1.12 Visual Resources

The scenic environment of the study area is generally characteristic of the Mojave-Sonoran Desert. The landforms consist of valleys, hills, alluvial fans, steep mountains and vestiges of volcanic formations. The vegetation is sparse.

The colors of the desert landscape range from dark grays and browns to light tans, and light green. Textures are medium to coarse for the mountain/hill areas, smooth to fine for the alluvial fan and wash area.

Man-made features become more dominant in urbanized areas and centers such as Barstow and Bakersfield. There are no known architectural structures of scenic significance.

There are two state designated scenic highways in the study area: State Highway 58 from Barstow to Inyo County, and State Highway 247 from Barstow to Highway 62.

The methodology for identifying the existing visual environment for potential areas of visual impacts included a three-stage process: data inventory, literature review and field reconnaissance; solution of potential visual impact; and narrative description.

The visual resource analysis techniques developed by the Forest Service (FS) and the Bureau of Land Management (BLM) have established a system to classify scenic resources, identify visual quality objectives and develop management policies for the administration of these resources.

The FS Visual Management System (VMS) is based upon the concept of establishing quality objectives for alteration of the visual resource by recognizing the great variation in visual strength of the various types of landscapes and their ability to accept change. The following FS VMS quality objectives are designed to develop measurable standards or objectives for the visual management of all lands. They are represented by five terms which are defined as visual resource management goals, and are identified by VQO (Visual Quality Objectives) in the text:

Preservation (P): Allows ecological changes only. Management activities, except for very low visual-impact recreation facilities, are prohibited.

Retention (R): Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Management activities should not be visually evident.

Partial Retention (PR): Management activities must remain visually subordinate to the characteristic landscape. Activities may repeat or introduce form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape.

Modification (M): Activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely, and at such a scale, that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional elements must remain visually subordinate to the proposed composition.

Maximum Modification (MM): Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may naturally establish form, line, color, or texture.

The BLM Visual Resource Management system (VRM) has similarities to the FS VMS system. The BLM management classes describe the different degrees of modification allowed to change the basic elements of the landscape. Class designations are derived from an overlay technique that combines the maps of: Scenic Quality (A-excellent, B-good, and C-fair), Sensitivity Levels (H-high, M-medium, and L-low), Distance Zones (Fg-foreground or Bg-background), and Visual Absorption Capacity (VAC) (H-high, M-Moderate, L-low). The overlays are used to identify areas with similar combinations of factors, although not all identified areas have the same level of visual definition. These areas are assigned to one of five management classes according to predetermined criteria; the five classes are:

Class I This class provides primarily for natural ecological changes; management activities are to be restricted and are not to attract attention.

Class II	Changes in basic elements by management activities should not be evident in the characteristic landscape.
Class III	Contrasts to the basic elements may be evident and begin to attract attention, but they should remain subordinate to the existing characteristic landscape.
Class IV	Alterations may attract attention but should repeat the form, line, color, and texture elements of the characteristic landscape.
Class V	Rehabilitation is needed to restore the landscape to the character of the surrounding landscape.

The BLM lands identified in all the visual resource sections are defined by management class and scenic quality. The BLM has categorized the scenic resources within the Mojave Desert. The predominant visual resource management classes in the study area as a whole are Class II and Class III. The predominant scenic quality is not exceptional and falls into Classes B and C.

3.1.12.1 Mojave Transfer Line

MP 8.0-11.5, VRM/VQO: Not Applicable
Description: Havasu National Wildlife Refuge. The landform consists of bottomland, drainage areas, and Colorado River shoreline zones. The vegetation consists of various riparian species including cottonwood, willow, and mesquite. Modifications include an underground pipeline corridor which the proposed route follows.

MP 16.0-16.5, VRM/VQO: Not Applicable
Description: Havasu National Wildlife Refuge. The landform consists of bottomland, drainage areas, and Colorado River shoreline zones. The vegetation consists of various riparian species including cottonwood, willow, and mesquite. Modifications include an underground pipeline corridor which the proposed route follows.

3.1.12.2 Mojave Mainline

MP 0-1.5, VRM/VQO: Not Applicable
Description: Colorado River Crossing. The landform consists of steep, rocky banks on both shores of the Colorado River. The vegetation consists of various riparian species including willow and mesquite. Modifications include three pipeline crossings and unpaved access roads, a railroad bridge, and the Interstate 40 bridge.

MP 1.5-9, VRM/VQO: BLM Class IIA
Description: Chemehuevi Mountains WSA. The landform consists of steep, barren slopes with rock outcrops up to 2900 feet. The vegetation consists of creosote bush scrub. Modifications include underground pipelines which the proposed route follows, pipeline access roads, abandoned mines, and primitive roads.

MP 9-12.2, VRM/VQO: BLM Class IIB
Description: Sacramento Mountains. The landform consists of rocky slopes at the base of the Sacramento Mountains and Chemehuevi Mountains. The vegetation consists of creosote bush scrub. Modifications include an underground pipeline which the proposed route follows, pipeline access roads, abandoned mines, and primitive roads.

MP 20.5-24.5, VRM/VQO: BLM Class IIA
Description: Stepladder Mountains WSA. The landform consists of small, rocky hills. The vegetation consists of creosote bush scrub. Modifications include underground pipelines which the proposed route follows and existing pipeline access roads.

MP 59-62, VRM/VQO: BLM Class IIA
Description: Cadiz Summit/Marble Mountains. The landform consists of gently sloping, flat terrain. The vegetation consists of creosote bush scrub. Modifications include underground pipelines which the proposed route follows and existing pipeline access roads.

MP 63.0-72.0, VRM/VQO: BLM Class IIIB
Description: Bristol Mountains. The landform consists of gently sloping, flat terrain. The vegetation consists of creosote bush scrub. Modifications include an underground pipeline which the proposed route follows and existing pipeline access roads.

MP 72.0-76.6, VRM/VQO: BLM Class III
Description: Lava Hills Wilderness Study Area. The landform includes Amboy Crater, ancient lava flows, and transitional desert terrain. The vegetation consists of the creosote bush scrub. Modifications include an existing natural gas pipeline which the proposed route would follow.

MP 241-241.5, VRM/VQO: Not Applicable
Description: Pacific Crest Trail. The landform consists of gently rolling ridgelines in the low Sierra Mountain foothills. The vegetation consists of low elevation pine and creosote bush scrub. Modifications include extensive wind farms, access roads, ~~and~~ grazing lands, and several pipelines.

3.2 MOJAVE ROUTE ALTERNATIVES

Material presented below is limited to a description of environmental characteristics associated with each route variation where these characteristics are unique or differ significantly from those associated with the proposed route. The reader is referred to Section 3.1 for information on topics not addressed under a particular route variation.

3.2.1 Alternative A

3.2.1.1 Air Quality

Air quality baseline information for Alternative A would be similar to figures listed in Tables 3.1-1 and 3.1-2. See also Section 3.1.1.

3.2.1.2 Geology

The geology of Alternative A is similar to that of the Mojave Transfer Line described in Section 3.1.2.1. Table 3.2-1 summarizes geologic and physiographic characteristics of this alternative.

3.2.1.3 Soil

Appendix A-1 lists and describes the soils that would be traversed by this alternative. Refer to the general description of soils that occur in the Mojave Desert region in Section 3.1.3.1. Alternative A would traverse predominantly deep sandy and very gravelly soils on sloping to moderately steep fan terraces within the Mojave Desert region. A few soils are shallow over hardpans. Water erosion potential is mostly low to moderate with high potential on short segments of steeper slopes. Wind erosion potential is high on sandy soils and low on very gravelly soils. Reclamation potential is mostly poor due to sandy textures, gravels and shallow depth [SCS, 1979].

3.2.1.4 Surface Water

See Section 3.1.4 of the Mojave Proposal for a general discussion on the surface water resources in the area. Alternative A would approximately parallel the Mojave Transfer Line about three to four miles to the east. This route would cross approximately 34 ephemeral to intermittent streams over its entire length, including Fivemile Wash, Warm Spring, and the Sacramento Wash.

The runoff characteristics of these streams are similar to those described for the proposed Mojave Transfer Line (Section 3.1.4). No significant water resources would be crossed by this alternative.

Table 3.2-1

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, MOJAVE ALTERNATIVES A AND B

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
		Alternative A			
Foothills of Black Mountains (MP 0-23)	Basin & Range	Alluvial fans	Quaternary	Moderate relief	Unconsolidated to poorly or moderately well consolidated deposits
		Alternative B			
Pisgah Crater to Poe (MP 0-8)	Mojave Desert	Alluvium, sedimentary volcanic rock	Quaternary	Low relief, gentle to moderate slopes	Unconsolidated to hard rock
Troy Lake (MP 8-14)	Mojave Desert	Playa lake deposits, dune sand	Quaternary	Flat	Unconsolidated material, salt, sand
Mojave Valley (MP 14-37)	Mojave Desert	Alluvium	Quaternary	Low relief, gentle slopes	Unconsolidated material
Barstow to Boron (MP 37-76)	Mojave Desert	Alluvium, sedimentary rock, some granite	Quaternary, Mesozoic	Low relief, gentle slopes to flat	Unconsolidated to poorly consolidated material, very hard granite

3.2.1.5 Groundwater

General groundwater conditions in the area of Alternative A are similar to those described for the valleys along the proposed Mojave Mainline. Specific conditions are discussed in Section 3.1.5.

3.2.1.6 Freshwater Biology

General Freshwater Biology. No major perennial drainages would be crossed by proposed Alternative A. The pipeline would cross several ephemeral to intermittent drainages which drain into Topock Marsh on the Colorado River; however, no significant aquatic habitat occurs in these drainages.

Species of Special Concern. None present.

3.2.1.7 Terrestrial Biology

3.2.1.7.1 Vegetation

General Vegetation. See Section 3.1.7.1 for a general discussion on the vegetation resources for the Mojave project. Alternative A would traverse Mojavean creosote bush scrub and wetland/riparian types, all within the Mojave Desert geographic region. Table 3.2-2 presents the distribution of these community types along the Alternative A route.

Plant Species of Special Concern. One candidate species, barrel cactus, occurs in the vicinity of the Alternative A route. The species is listed and described in Appendix C-1.

Table 3.2-2

VEGETATION COMMUNITY TYPES, MOJAVE ALTERNATIVE A

Geographic Region	Community Type	Milepost
Mojave Desert	Mojavean creosote bush scrub	0.0-17.5
	Wetland/riparian	17.5-18.0
	Mojavean creosote bush scrub	18.0-23.0

3.2.1.7.2 Wildlife

General Wildlife. The entire Alternative A lies within the creosote bush scrub habitat of the Mojave Desert region. Typical wildlife present is identical to that noted for the upland areas of the Mojave Transfer Line (Section 3.1.7.2.1). No designated important game or raptor habitat has been identified along this proposed alternative.

Wildlife Species of Special Concern. Species of federal or state concern are identical to those noted for the Mojave Transfer Line and are listed in Table 3.2-3. The Yuma clapper rail, bald eagle and peregrine falcon potentially occur within 0.5 mile of the terminus of this alternative, although the habitat is not optimal. No nests or roost sites have been identified for the area of concern. The desert tortoise potentially occurs over the extent of this alternative, although no discrete populations have currently been identified along the proposed route.

Table 3.2-3

WILDLIFE SPECIES OF SPECIAL CONCERN,
MOJAVE ALTERNATIVES

Species 1/ /status	Alternative A	Alternative B
Yuma Clapper Rail/FE,CA-T, AZ-3	x 2/	-
Bald eagle/FE,CA-E,AZ-2	x	-
Peregrine falcon/FE,CA-E, AZ-3	x	-
Osprey/AZ-3	x	-
Mississippi Kite/AZ-3	x	-
Great egret/AZ-4	x	-
Snowy egret/AZ-4	x	-
Black-crowned night heron/AZ-4	x	-
Desert tortoise/FC,BLM-S,CA-P, AZ-3	x	x
Mohave ground squirrel/ FC,CA-T	-	x

1/ FE = Federally listed as endangered; FC = Candidate for federally listed as threatened or endangered; BLM-S = BLM sensitive species; CA-E = Listed as endangered by the State of California; CA-T = Listed as threatened by the State of California; CA-P= Protected by the State of California; AZ-2=Arizona Group 2; AZ-3=Arizona Group 3; AZ-4=Arizona Group 4.

2/ Indicates potential occurrence along the proposed alignment.

3.2.1.7.3 Grazing

Alternative A would intersect approximately 21 miles of BLM wildlife habitat where grazing does not occur. Private land, for which detailed grazing information is not available, constitutes approximately three miles of the land that would be intersected.

3.2.1.8 Socioeconomics

Population housing, economic characteristics, recreation, traffic and noise data for Alternative A have been discussed in Sections 3.1.8.1, 3.1.8.2, and 3.1.8.4.

No sensitive noise receptors are located in the proximity of the Alternative A route.

No designated recreational areas are within the mile-wide study corridor. Near the southern end of the proposed alternative a jeep trail heads northeastward toward the Black Mountains. Since most of the land is public (BLM), access is possible via small roads from the Colorado River and Fort Mojave Indian Reservation. Informal use of the area may include hiking, rockhounding, and vehicular exploration.

3.2.1.9 Land Ownership/Use

Mojave's Alternative A is proposed as an alternative to the planned Transfer Line. It begins in a southerly direction at approximately MP 637.5 of Transwestern's Mainline, and is located totally in Mohave County, Arizona. The BLM land is designated as wildlife habitat with no grazing. The route is within the existing BLM Davis-Parker utility corridor and is adjacent to the Warm Springs WSA from MP 8-14. At approximately MP 18, Alternative A heads west to the Topock Compressor Station. The land use in the area is zoned residential by Mohave County. The one mile of state land is leased for wildlife habitat.

3.2.1.10 Cultural Resources

The cultural resources data for this and all other alternatives to the Mojave proposal are presented in the following two tables which summarize numbers of sites and their National Register status and numbers of site types.

Little or no research or survey coverage exists for Alternative A. No cultural resources are known to exist within the mile-wide analysis corridor. This pipeline segment needs to be surveyed to determine the true nature of cultural resources along its length.

See Section 3.1.10.2 for discussion of American Indian concerns. There are no specific concerns with regard to Alternative A.

Table 3.2-4

KNOWN CULTURAL RESOURCE SITES, MOJAVE ALTERNATIVES

Alternative (State)	Sites and National Register Status [1]: Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
Alternative A (Arizona)	-	-	-	-
Alternative B (California)	1	0/1	-	42

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[1] National Register status here refers only to the results of official determinations. Other sites may meet the eligibility criteria but have not been formally evaluated.

Table 3.2-5

KNOWN CULTURAL RESOURCE TYPES, MOJAVE ALTERNATIVES

Type	Alternatives: A	B
Campsite	-	1
Scatters		
Lithic	-	31
Lithic, Ceramic and groundstone	-	2
Features		
Quarry	-	(1)
Burial	-	1
Petroglyphs	-	1
Rock Alignment	-	1
Isolated Find	-	2
Historic Features		
Historic Dump	-	(1)
Historic Structure	-	2
Historic Town/Cemetery	-	1
Unknown	-	2
Total Sites	0	44

Figures in parentheses refer to additional instances occurring at sites which have already been counted once in the table.

3.2.1.11 Paleontological Resources

Refer to Table 3.1-23 and Section 3.1.11.

3.2.1.12 Visual Resources

MP 0-1.8, VRM/VQO: BLM Class III
Description: The landform consists of gently sloping desert terrain to the east of the Colorado River floodplain. The vegetation consists of creosote bush scrub. Modifications include transmission lines, ~~Fort Mojave Indian Reservation, town of Powell, Interstate 40, U.S. Route 66,~~ and access roads.

MP 6-10.7, VRM/VQO: BLM Class III
Description: The landform consists of gently sloping desert terrain east of the Colorado River floodplain. The vegetation consists of creosote bush scrub. Modifications include ~~Interstate 40,~~ transmission lines and access roads.

3.2.2 Alternative B

3.2.2.1 Air Quality

Air quality baseline information for Alternative B would be similar to figures listed in Tables 3.1-1 and 3.1-4A. See also Section 3.3.1.

3.2.2.2 Geology

Geology and Physiography. The geology for Alternative B is similar to that discussed in Section 3.1.2.2 for the portion of Mojave Mainline that would traverse the Mojave Desert. Table 3.2-1 summarizes geologic and physiographic characteristics along the alternative.

Faulting and Seismicity. The route from Pisgah Crater to Barstow (MP 0-37) traverses an area of moderate seismicity as described in Section 3.1.2.2. Alternative B would cross several Quaternary faults. These faults are identified in Table 3.1-6.

Slope Stability. Because most of the terrain that would be traversed by Alternative B is gently sloping to flat, the potential for landslides is low. Although minor landsliding may occur on steep streambanks, such banks are small and occur locally. Debris flows may occur in the arroyos that have dissected the alluvial fans.

Unique Geologic Features. The alternative route would cross the south end of Troy Lake (MP 8-14), and also the sand dunes west of the lake (MP 14-15) [Jennings, 1975].

Mineral/Petroleum Resources. Deposits of zeolite ~~(hectorite)~~ occur along the proposed route of Alternative B in the Hector-Lavic area (MP 0-5). The route also traverses scattered sand and gravel deposits in the area of Barstow and Newberry (MP 18-37).

3.2.2.3 Soil

Appendix A-1 lists and describes the soils that would be traversed by this alternative. Refer to the general description of soils that occur in the Mojave Desert region presented in Section 3.1.3.1. In the Mojave Desert region, proposed Alternative B would traverse predominantly deep soils on fans, terraces, basins and plains. Shallow soils are uncommon and occur either on foothills and mountains or on alluvial surfaces underlain by hardpans. Water erosion potential is mostly low. Wind erosion potential is mostly moderate and high. Reclamation potential is mostly poor. Sandy textures, salinity, and alkalinity are the primary limiting factors.

3.2.2.4 Surface Water

Mojave Alternative B would cross approximately 100 ephemeral to intermittent drainages including the Mojave River. All drainages crossed lie within the Mojave River Basin. The Mojave River is crossed once, immediately downstream from Barstow, California. The only other major ephemeral to intermittent drainage is Daggett Wash. No significant water resources occur along this alternative.

3.2.2.5 Groundwater

General groundwater conditions along the route of the Alternative B line are similar to those described for the valleys along the proposed Mojave Mainline. Between MP 30-40, much of the alternative is in or adjacent to the Mojave River. The river is a significant alluvial aquifer supplying virtually all communities and farms in the area. Other specific conditions are described in Section 3.1.5.

3.2.2.6 Freshwater Biology

General Freshwater Biology. No perennial streams would be crossed by proposed Alternative B. Several intermittent drainages of various sizes would be crossed, the largest of which is the Mojave River. Aquatic communities in the ephemeral streams crossed by the Alternative B are comparable to those discussed under Section 3.1.6. The Mojave River does provide some fisheries habitat. After heavy rains, sunfishes, arroyo chub, largemouth bass, mosquito fish, threespine stickleback, and white crappie have been observed in the Mojave River and other ephemeral habitats [Brown, 1978].

3.2.2.7 Terrestrial Biology

3.2.2.7.1 Vegetation

General Vegetation. See Section 3.1.7.1 for a general discussion on the vegetation resources for the Mojave project. Mojave Alternative B would traverse the Mojavean creosote bush scrub, desert saltbush scrub, agricultural land, Mojave saltbush UPA, Joshua tree woodland, and the wetland/riparian community types within the Mojave Desert geographic region. Table 3.2-6 presents the distribution of these types along the Alternative B route.

Plant Species of Special Concern. Approximately nine plant species of concern and associated habitats are located along the Alternative B pipeline route. All nine species are candidates for federal listing, and eight of the species are of concern to the CNPS. Appendix C describes these species.

Table 3.2-6

VEGETATION COMMUNITY TYPES,
MOJAVE ALTERNATIVE B

Geographic Region	Community Type	Milepost
Mojave Desert	Mojavean creosote bush scrub	0.0-1.1
	Desert saltbush shrub	1.1-11.7
	Mojavean creosote bush scrub	11.7-31.3
	Wetland/riparian	31.3-31.9
	Mojavean creosote bush scrub	31.9-40.0
	Agricultural land	40.0-41.9
	Mojavean creosote bush scrub	41.9-43.4
	Agricultural land	43.4-45.2
	Mojave saltbush [1]	45.2-66.7
	Joshua tree woodland	66.7-68.5
	Mojave saltbush [1]	68.5-76.0

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[1] Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage [BLM, 1980].

3.2.2.7.2 Wildlife

General Wildlife. All of Alternative B would lie within the Mojave Desert region. The same habitats and characteristic wildlife species are present as those noted for the Mojave Mainline within the Mojave Desert region. Much of the eastern half of Alternative B would traverse disturbed habitat. The route closely follows the Atchison Topeka and Santa Fe Railroad line as well as Interstate 40. The Mojave Mainline route, which is in the same general area, does not follow the route of the railroad or highway. No designated important game habitat has been identified along this proposed alternative.

The BLM [1980] has identified two potential golden eagle nesting areas that are crossed or adjacent to this alternative. The alternative runs adjacent to approximately three miles of potential nesting habitat in the Newberry Mountains, and crosses approximately nine miles of potential nesting habitat in the Nebo area southeast of Barstow.

Species of Special Concern. The entire alternative traverses potential desert tortoise habitat. The proposed ROW crosses approximately one mile of high density habitat (100-250 tortoise/mi^2), 19 miles of moderate density habitat (50-100 tortoise/mi^2) and 20 miles of low density habitat (20-50 tortoise/mi^2). These density figures are based on Berry [1984]. Because the tortoise and its habitat is sensitive to harassment, exact locations of these sites are not delineated in this document. Besides these identified concentration sites, desert tortoise may occur anywhere along the proposed route within this region.

Approximately 30 miles of occupied range for the Mohave ground squirrel would also be crossed by the proposed line within desert scrub habitat west of Barstow.

Swainson's hawks are rare summer breeders in the Mojave Desert region [BLM, 1985b]. At present, no active nests are known to exist along the proposed route. The ferruginous hawk does not breed within the area of concern [BLM,1985b]. Both species may occur as migrants or winter visitors.

The yellow-billed cuckoo is a federal candidate and a California threatened species. It is a resident of dense riparian habitat, and consequently only occurs in the area ~~only~~ as a rare migrant [BLM, 1985b].

3.2.2.7.3 Grazing

A combination of private and ungrazed public lands comprise two-thirds of the land that would be traversed by Alternative B. The remainder of the land traversed includes a livestock grazing allotment of 1,645 acres located west of Barstow, California, along California Highway 58E. Cattle are the predominant livestock on this allotment.

3.2.2.8 Socioeconomics

Population, housing, economic characteristics, recreation, traffic, and noise have been discussed in Sections 3.1.8.1, 3.1.8.2, and 3.1.8.4.

The Alternative B route lies 1000 feet or less south of State Highway 58 between MP 58 and 74. Within this area is the All American Pipeline.

3.2.2.9 Land Ownership/Use

Mojave's Alternative B traverses portions of San Bernardino County and one mile of Kern County. It deviates from the proposed mainline at approximately MP 112. This alternative stays within the BLM designated utility corridor G for the entire route. The Newberry Mountains WSA is located south of the proposed alternative from approximately MP 16.5 to 27. To the north of the same area the land use is scattered irrigated agriculture with some residential areas. It passes within 0.5 mile of Daggett, Barstow, and Boron. These towns and other areas have approximately 82 homes that would be within 100 feet of the proposed pipeline alternative at MPs 13, 20, 21-22.5, 30, 43, 46, and 74. Since there are existing cities in the area the probability of development is high. A little over a mile of Edwards Air Force Base is also crossed at Kramer Junction.

3.2.2.10 Cultural Resources

At least 20 surveys have been conducted within or partially within the mile-wide analysis corridor centered on this pipeline segment of about 76 miles. About 11.5 miles (15.1 percent) of the pipeline construction ROW have already been surveyed, including 9.5 miles covered by the Celeron/All American intensive survey. In addition, about 8.1 miles of survey were done directly adjacent to (or perhaps partially covering) the construction ROW, including 7.0 miles for the Celeron/All American intensive survey.

The cultural resources data for Alternative B are presented in Tables 3.2-4 and 3.2-5 (see Section 3.2.1.10 describing Alternative A) which summarize numbers of sites and their National Register status and numbers of site types.

There are 44 known cultural resource sites located within the mile-wide analysis corridor. One site, the Harvey House Railroad Depot in Barstow, is listed on the National Register. Another site, Buzzard Rock with its petroglyphs, has been nominated to the register. Finally, two sites are listed in the California Inventory of Historic Resources: Alf's Blacksmith Shop in Daggett and the town of Daggett itself.

See Section 3.1.10.2 for a discussion of American Indian concerns. There are no specific concerns with regard to Alternative B.

There are two high sensitivity pipeline segments along this route.

3.2.2.11 Paleontological Resources

Refer to Tables 3.1-23 and Section 3.1.11.

3.2.2.12 Visual Resources

MP 6.5-9, VRM/VQO: BLM Class IIB
Description: The landform consists of a wide desert valley adjacent to lower desert foothills near the Rodman Mountains, lava beds, and Pisgah Crater. The vegetation consists of creosote bush scrub. Modifications include existing natural gas pipelines which would be followed, Interstate 40, U.S. Route 66, town of Hector, mining operations, AT&SF railroad, and access roads.

3.3 INTEGRATED INTRASTATE SYSTEM ALTERNATIVE

Because the only new required facility on the Integrated Intrastate System Alternative would be the equivalent of the Mojave Transfer Line, the reader is referred to the portions of this document covering that part of the Mojave Proposal. (The remainder of the section has been deleted from the DEIS/EIR).

3.4 EL DORADO PIPELINE ~~PROPOSAL~~ ALTERNATIVE

Because of the nearly identical proposed alignments for much of the El Dorado and Mojave alignments, the reader is often referred to appropriate sections of the Mojave Pipeline Proposal for descriptions of the affected environment.

3.4.1 Air Quality

See Section 3.1.1.

3.4.2 Geology

The El Dorado ~~Mainline~~ Alternative ~~(including the West Delivery Lateral)~~ would traverse similar geologic conditions as those discussed for the Mojave ~~Mainline~~ Proposal in Section 3.1.2.2 including the fault crossings identified in Table 3.1-6. Table 3.4-1 lists the various geologic features that would be encountered along the route. Several unique geologic features include the Marble Mountain Fossil Bed (MP 68) and Pisgah Lava Flow (MP 107-115).

3.4.3 Soil

The soils that would be traversed by this proposal are listed and described by milepost in Appendix A-2. The information on soils that occur along the routes was obtained from published and unpublished soil surveys prepared by the USDA Soil Conservation Service and other land management agencies.

3.4.3.1 North Receipt Lateral

The general characteristics of soils that would be traversed by the North Receipt Lateral within the Mojave Desert region are the same as described for the Mojave Transfer Line Section 3.1.3.1.

3.4.3.2 El Dorado Mainline

The soils that would be traversed by the El Dorado Mainline, including the West Delivery Lateral, are the same as those described for the Mojave Mainline in Section 3.1.3.2.1 for the Mojave Desert, Section 3.1.3.2.2 for the Tehachapi Mountains, and Section 3.1.3.2.3 for the San Joaquin Valley regions.

3.4.3.3 East Delivery Lateral

The soils that would be traversed by the East Delivery Lateral from MP 0.0-15.4 are the same as described for MP 0.0-18.0 of the Mojave Kern Lateral within the San Joaquin Valley region (see Section 3.1.3.3).

From MP 15.4-35.8 of the East Delivery Lateral, the soils that would be traversed include soils on uplands and on alluvial landforms. The soils are moderately deep with a low to very high water erosion potential and a low wind erosion potential. Reclamation potential ranges from poor to fair with slope and insufficient topsoil quantities being the primary limitations to successful reclamation. Soils on flat to gently sloping alluvial plains, fans, terraces, and river bottoms are deep to very deep, well drained clay loam, sandy loam, and gravelly sandy loam soils. Water erosion potential is predominantly low with some

Table 3.4-1

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, EL DORADO PIPELINE PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
North Receipt Lateral					
Eastern side of Mohave Valley, base of foothills of Black Mountains (MP 0-16.5)	Basin & Range	Alluvium	Quaternary	low to moderate relief, dissected canyons	Unconsolidated to poorly consolidated deposits, alluvial fan deposits
Mainline and West Delivery Lateral					
Colorado River Valley (MP 0-2)	Mojave Desert	Alluvium and sedimentary rocks	Quaternary	low relief, gentle slopes	Alluvial fan deposits, poorly consolidated rock
Base of Chemehuevi Mountains (MP 3-10)	Mojave Desert	Igneous and metamorphic rocks	Mesozoic to Precambrian	low relief, moderate slopes	Granite, gabbro, gneiss, and schist
North end of Chemehuevi Valley (MP 11-20)	Mojave Desert	Sedimentary rocks and alluvium	Quaternary	low relief, gentle slopes	Alluvial fan deposits, poorly consolidated rock
Stepladder Mountains (MP 21-24)	Mojave Desert	Igneous and metamorphic rocks	Mesozoic & Precambrian	moderate relief, moderate to steep slopes	Granite, gneiss and schist
Ward Valley (MP 25-38)	Mojave Desert	Alluvium and sedimentary rocks	Quaternary	moderate to low relief, gentle slopes	Unconsolidated to poorly consolidated material
Saddle between Piute and Old Woman Mountains (MP 39-41)	Mojave Desert	Sedimentary and igneous rocks	Tertiary & Mesozoic	moderate relief, gentle slopes	Sandstone, shale, conglomerate, breccia, and granite
Fenner Valley (MP 42-68)	Mojave Desert	Alluvium	Quaternary	low relief, flat to gentle slopes	Unconsolidated material
Marble Mountains (MP 69-71)	Mojave Desert	Igneous rocks	Tertiary	low relief, moderate slopes	Volcanic flow rocks
Cadiz Valley (MP 72-76)	Mojave Desert	Alluvium and sedimentary rocks	Quaternary	low relief, gentle slopes	Unconsolidated to poorly consolidated material
Bristol Mountains (MP 77-79)	Mojave Desert	Igneous and metamorphic rocks	Mesozoic to Precambrian	low relief, moderate slopes	Granite and gneiss
Cadiz Valley (MP 80-120)	Mojave Desert	Alluvium and sedimentary rocks	Quaternary	low relief, gentle slopes	Unconsolidated to poorly consolidated material
Mojave Valley (MP 121-140)	Mojave Desert	Playa basin deposits, dune sand, alluvium	Quaternary	low relief, flat to gentle slopes	Salt, sand and gravel

Table 3.4-1 (continued)

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, EL DORADO PIPELINE PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
North end of Ord Mountains (MP 141-153)	Mojave Desert	Alluvium, igneous and sedimentary rocks	Quaternary & Tertiary	low relief, gentle to moderate slopes	Pyroclastic and volcanic mud flow deposits, volcanic flow rocks, sandstone, shale, and loosely consolidated material
Mojave River, Antelope, and Fremont Valleys (MP 154-230)	Mojave Desert	Alluvium, igneous, metamorphic and sedimentary rocks	Quaternary, Tertiary, Mesozoic, Precambrian	low relief, gentle slopes	Sand, gravel, conglomerate, shale, sandstone, marble, gneiss, granite, and volcanic flow rocks
Tehachapi Mountains (MP 231-261)	Southern Sierra Nevada	Alluvium, igneous, metamorphic and metasedimentary rocks	Quaternary, Mesozoic	high relief, moderate to steep slopes	Sand, gravel, chert, slate, quartzite, schist, gneiss, and granite
Southern San Joaquin Valley (MP 262-291)	Great Valley	Dune sands, lake deposits, alluvial fan deposits, sedimentary rocks	Quaternary, Tertiary	low relief, flat to gentle slopes	Unconsolidated to poorly consolidated salt, sand and gravel, alluvial fan deposits, sandstone and shale
Temblor Range (MP 292-310)	Great Valley	Sedimentary rocks	Tertiary	low relief, moderate to steep slopes	Moderately to well consolidated sandstone, shale, sandstone conglomerate, and breccia
Little Santa Maria, McKittrick, and San Joaquin Valleys (MP 311-324)	Great Valley	Alluvium	Quaternary	low relief, gentle slopes	Unconsolidated to poorly consolidated sand, gravel, and alluvial fan deposits
East Delivery Lateral					
Eastern San Joaquin Valley (MP 0-36)	Great Valley	Alluvial fan deposits	Quaternary	low relief, gentle to moderate slopes	Unconsolidated to poorly consolidated material
Alternative A					
Fenner and Cadiz Valleys (MP 0-75.4)	Mojave Desert	Alluvium and sedimentary rocks	Quaternary	low relief, gentle slopes	Unconsolidated to poorly consolidated material
Alternative B					
Tehachapi Mountains and Bear Valley (MP 0-8.3)	Southern Sierra Nevada	Alluvium, igneous, metamorphic and metasedimentary rocks	Quaternary, Mesozoic	high relief, moderate to steep slopes	Sand, gravel, chert, slate, quartzite, schist, gneiss, and granite
Alternative C					
Tehachapi Mountains (MP 0-5.6)	Southern Sierra Nevada	Igneous, metamorphic, and metasedimentary rocks	Mesozoic	high relief, moderate to steep slopes	Chert, slate, quartzite, schist, gneiss, and granite

areas of moderate potential. Wind erosion potential is mostly low with some areas with moderate and high potential. Reclamation potential is predominantly good except in areas with very coarse textures and steep slopes.

3.4.4 Surface Water

The introductory discussion of surface water resources that would be traversed by the Mojave Proposal routes presented in Section 3.1.4 ~~apply~~ also applies to this ~~proposal~~ alternative. Table 3.4-2 lists the major stream channels that would be crossed by the various routes of this proposal.

3.4.5 Groundwater

The groundwater conditions that would be encountered along the El Dorado route are similar to those described in Section 3.1.5 of the Mojave Proposal.

3.4.6 Freshwater Biology

The El Dorado Pipeline would either follow the same route as the proposed Mojave Pipeline or closely parallel it within the same geographic regions. Therefore, descriptions of the affected environment along the route of the Mojave Pipeline also apply to the El Dorado Pipeline. Refer to Section 3.2.6 of this document for a description of the affected environment.

3.4.7 Terrestrial Biology

3.4.7.1 Vegetation

The introductory description of vegetation resources presented in Section 3.1.7.1 of the Mojave Proposal also applies to the resources that would be traversed by the El Dorado Proposal. Table 3.4-3 lists vegetation community types that would be traversed by the proposed project. Appendix C lists plant species of special concern that may occur along the route of the proposed project and describes the status and habitat of these species. Table 3.4-4 presents legally protected plant species that may occur along the proposed route.

Table 3.4-2
MAJOR DRAINAGE CHANNELS, EL DORADO PIPELINE PROPOSAL

Pipeline Component	Drainage Basin	Drainage Channel	Flow Class 1/	Sensitivity 2/ Side-Slope	Sensitivity 2/ Channel Bed	Mile post
North Receipt Lateral	Colorado River	Fivemile Creek	I	-	-	10.1
		Warm Springs	I	-	-	10.4
		Sacramento Wash	I	-	-	15.1
Mainline	Colorado River	Colorado River	P	L	L	1.5
		Cave Wash	I	-	-	2.0
	Mojave River	Bonanza Spring	I	-	-	55.0
		Clipper Wash	I	-	-	60.1
		Willow Spring	I	-	-	70.1
		Mojave River	I	L	L	155.3
		Los Angeles Aqueduct	NA	-	-	227.0
	Buena Vista Lake	Mendiburu Canyon	I	-	-	235.2
		Blackburn Canyon	I	-	-	235.2
		Antelope Canyon	I	-	-	235.4
		Water Canyon	I	-	-	240.2
		Brite Creek	I	-	-	243.4
		Brite Creek	I	-	-	247.0
		Warm Spring	I	-	-	260.1
		Tejon Creek	I	-	-	260.5
		California Aqueduct	NA	-	-	295.0
		Twentyone Creek	I	-	-	300.3
		Sandy Creek	I	-	-	302.0
		Seventeen Canyon	I	-	-	304.1
		McLeod Canyon	I	-	-	305.0
		Buena Vista Creek	I	-	-	310.1
East Delivery Lateral	Buena Vista Lake	Caliente Creek	I	-	-	9.4
		Kern River	P	L	L	23.5
		Sacramento Gulch	I	-	-	25.0
		West Shore Gulch	I	-	-	27.0
		Unnamed stream	I	-	-	29.7
	Tulare Lake	Poso Creek	I-P	L	M	35.4

1/ I = intermittent; P = perennial; - = ditch or canal, artificial flow

2/ Channel Bed Gradient: L = low 0-1% M = moderate 1-3% H = high >3%
Sideslope (topographic slope): L = low 0-5% M = moderate, 5-20%
H = high > 20%

Table 3.4-3
VEGETATION COMMUNITY TYPES, EL DORADO PIPELINE PROPOSAL

Project Component	Geographic Region	Community Type	Milepost
North Receipt Lateral	Mojave Desert	Mojavean creosote bush scrub	0.0-14.0
		Wetland/riparian	14.0-14.5
		Mojavean creosote bush scrub	14.5-16.5
Mainline (including West Delivery Lateral)	Mojave Desert	Mojavean creosote bush scrub	0.0-1.0
		Wetland/riparian	1.0-1.3
		Mojavean creosote bush scrub	1.3-20.0
		Teddybear cholla 1/	20.0-22.9
		Mojavean creosote bush scrub	22.9-90.0
		Crucifixion thorn 2/	90.0-93.2
		Mojavean creosote bush scrub	93.2-113.0
		Desert saltbush scrub	113.0-124.0
		Mojavean creosote bush scrub	124.0-157.0
		Wetland/riparian	157.0-157.3
		Agricultural land/ Mojave saltbush 3/	158.0-160.0
		Mojave saltbush 3/	160.0-177.0
		Joshua tree woodland	177.0-179.0
		Mojave saltbush 3/	179.0-189.0
		Joshua tree woodland	189.0-190.0
		Mojave saltbush 3/	190.0-197.0
		Mojavean creosote bush scrub	197.0-218.0
		Joshua tree woodland	218.0-223.0
	Tehachapi Mountains	Mojavean juniper woodland scrub	223.0-228.0
		Digger pine-oak woodland	228.0-232.0
		Agricultural land	232.0-234.0
		Digger pine-oak woodland	234.0-253.0
		Valley and foothill grassland	253.0-255.0
	San Joaquin Valley	Valley and foothill grassland	254.0-258.0
		Agricultural land	258.0-286.0
		Valley and foothill grassland	286.0-290.0
		Agricultural land	290.0-292
		Valley and foothill grassland	292.0-324.0

Table 3.4-3 (continued)

VEGETATION COMMUNITY TYPES, EL DORADO PIPELINE PROPOSAL

Project Component	Geographic Region	Community Type	Milepost
East Delivery Lateral	San Joaquin Valley	Agricultural land/ urban/valley and foothill grassland	0.0-22.0
		Great Valley mixed riparian forest	22.0-22.4
		Valley and foothill grassland	22.4-35.0
		Great Valley mixed riparian forest	35.0-35.3
		Valley and foothill grassland	35.3-35.8

1/ Sacramento/Stepladder Mountains Teddybear Cholla Unusual Plant Assemblage [BLM, 1980].

2/ Crucifixion Thorn Unusual Plant Assemblage [BLM, 1980].

3/ Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage [BLM, 1980].

Table 3.4-4

LEGALLY PROTECTED PLANT SPECIES, EL DORADO PIPELINE PROPOSAL

Species	Status 1/	Mainline	East Delivery Lateral
Red rock tarweed	CA-R, C1	X	-
Tulare Pseudobahia	CA-E, C2	X	X
Striped adobe lily	CA-T, C2	X	X
Bakersfield saltbush	CA-E, C1	X	X
California jewel flower	CA-E, C2	X	X

1/ C1 = Federal candidate, enough data on file to support federal listing; C2 = Federal candidate, insufficient data on file to; support federal listing; CA-R = State of California protected, rare; CA-E = State of California protected, endangered; CA-T = State of California protected, threatened

3.4.7.1.1 North Receipt Lateral

General Vegetation. Vegetation community types that would be traversed by the proposed route are the same as described for the Mojave Transfer Line, Section 3.1.7.1.1.

Plant Species of Special Concern. Plant species of special concern that would be encountered along the route of this line are the same as described for the Mojave Transfer Line, Section 3.1.7.1.1.

3.4.7.1.2 El Dorado Mainline

Mojave Desert (MP 0-223)

General Vegetation. Vegetation community types that would be traversed by the El Dorado Mainline are the same as listed for the Mojave Mainline. In addition to the Mojave saltbush UPA, the teddybear cholla UPA and the crucifixion thorn UPA [BLM, 1980] would be traversed by the El Dorado Mainline.

Plant Species of Special Concern. Plant species of special concern that may be encountered along the route of this line are the same as described for the Mojave Mainline. Of these candidate species, crucifixion thorn, desert cymopterus, and Barstow wooly sunflower are known to occur within or in close proximity to the proposed ROW. Of particular note is the California listed rare species, red rock tarweed, which inhabits moist seeps, springs, and washes within this region.

Tehachapi Mountains (MP 223-255)

General Vegetation. Vegetation community types that would be traversed within this region are the same as those listed in the Mojave Mainline. In addition, agricultural land in the Tehachapi and Cummings Valleys would be traversed.

Plant Species of Special Concern. Plant species of special concern that may be encountered along this segment of the mainline are the same as described for the Mojave Mainline.

San Joaquin Valley (MP 255-324.3)

General Vegetation. Vegetation types that would be traversed by this segment of the mainline are the same as listed in the Mojave Proposal.

Plant Species of Special Concern. Plant species of special concern that may be encountered along this segment of the mainline are the same as described for the Mojave Mainline. In addition, Comanche Point layia, a federal candidate species is known to occur in close proximity to the proposed ROW.

3.4.7.1.3 East Delivery Lateral

General Vegetation. The East Delivery Lateral would predominantly traverse a mosaic of agricultural land/urban/valley and foothill grassland types within both the San Joaquin and Tehachapi Mountains geographic regions. Great Valley mixed riparian forest would be traversed at the proposed crossings of Kern River and Poso Creek.

Plant Species of Special Concern. Approximately sixteen plant species of special concern may occur along the Kern Lateral including fifteen federal candidates, a rare plant of concern to the CNPS, and four State of California protected species. The California endangered species include California jewel flower, Tulare pseudobahia, Bakersfield saltbush, and the threatened species, striped adobe lily. Of the federal candidates, Bakersfield beavertail cactus, Comanche Point layia, and Coville's navarretia are known to occur within or in close proximity to the proposed ROW.

3.4.7.2 Wildlife

The introductory description of the wildlife resources, scope of analysis and sources of information presented in Section 3.1.7.2 of the Mojave Proposal are also applicable to the El Dorado Proposal. In many cases, important general wildlife and species of special concern are the same as described under the appropriate section of the Mojave Proposal, and the reader is often referred to that proposal for a description of the species addressed. Where differences occur, they are delineated under the specific section of the El Dorado Proposal. Table 3.4-5 presents the species of special concern, their status, and the ~~miles of suitable habitat for each species crossed by each~~ alignment on which they have been identified.

3.4.7.2.1 North Receipt Lateral

General Wildlife. Characteristic wildlife that occurs within the habitats along this alignment are the same as described for the Mojave Transfer Line.

Wildlife Species of Special Concern. Wildlife species of special concern potentially occurring along the proposed route are the same, and occur to the same extent along this alignment as those described for the Mojave Transfer Line.

Table 3.4-5

WILDLIFE SPECIES OF SPECIAL CONCERN, EL DORADO PIPELINE PROPOSAL

Species/ [1] status	North Receipt Lateral	El Dorado Mainline	Alt. A	Alt. B	Alt. C	East Delivery Lateral
Yuma clapper rail/FE,CA-T	x [2]	x	-	-	-	-
Bald eagle/FE,CA-E	x	x	-	-	-	-
Peregrine falcon/FE,CA-E	x	x	-	-	-	-
California condor/FE,CA-E	-	x	-	x	x	x
Ferruginous hawk/FC	-	x	x	-	x	-
Swainson's hawk/FC	-	x	x	-	-	-
Tricolor blackbird/FC	x	x	-	-	-	x
Mountain plover/FC	-	x	-	-	-	x
Osprey/AZ-3	x	x	-	-	-	-
Mississippi Kite/AZ-3	x	x	-	-	-	-
Great egret/AZ-4	x	x	-	-	-	-
Snowy egret/AZ-4	x	x	-	-	-	-
Black-crowned night heron/AZ-4	x	x	-	-	-	-
Blunt-nosed leopard lizard/FE, CA-E	-	x	-	-	-	x
Gila monster/FC	-	x	x	-	-	-
Tehachapi slender salamander/FC,CA-T	-	x	-	x	x	-
Desert tortoise/FC,AZ-3, CA-P, BLM-S	x	x	x	-	-	-
Desert Bighorn/BLM-S	-	x	-	-	-	-
San Joaquin kit fox/FE,CA-T	-	x	-	-	-	x
Giant kangaroo rat/FE,CA-E	-	x	-	-	-	-
Tipton kangaroo rat/FC **(FPE)**	-	x	-	-	-	x
Short-nosed kangaroo rat/FC	-	x	-	-	-	-
San Joaquin Pocket Mouse/FC	-	x	-	-	-	x
Nelson's antelope squirrel/FC,CA-T	-	x	-	-	-	-
Mohave ground squirrel/FC, CA-T	-	x	-	-	-	-
Bonytail chub/AZ-2	x	x	-	-	-	-
Razorback sucker/AZ-3	x	x	-	-	-	-
Morrison's blister beetle/FC	-	x	-	-	x	-
Moestan's blister beetle/FC	-	x	-	-	x	-
Molestan's blister beetle/FC	-	x	-	-	x	-
Hopping's blister beetle/FC	-	x	-	-	x	-

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[1] FE = Federally listed as endangered; FC = Candidate for federally listing as threatened or endangered; FPE= Federally proposed endangered; AZ-2= Listed in Group 2 by the state of Arizona; AZ-3= Listed as Group 3 by the state of Arizona; AZ-4= Listed in Group 4 by the state of Arizona; CA-E = Listed as endangered by the state of California; CA-T = Listed as threatened by the state of California; CA-P=Protected by state of California; BLM-S=Bureau of Land Management sensitive species.

[2] indicates potential presence of this species along a given alignment. Specific locations are not included in order to avoid potential harrassment of these species and their suitable habitats.

3.4.7.2.2 El Dorado Mainline

Mojave Desert Region (MP 0-223)

General Wildlife. Wildlife habitats and characteristic general wildlife along the proposed route are the same as described for the Mojave Desert region of the Mojave Mainline.

The proposed route crosses approximately 62 miles of potential golden eagle nesting habitat [BLM, 1980]. These sites occur within the Piute, Old Woman, Marble, Bristol, Cady and Calico mountains, as well as in the Nebo area and Fremont Valley.

Wildlife Species of Special Concern. The bald eagle, peregrine falcon, Yuma clapper rail, California condor, Gila monster, Swainson's hawk, ferruginous hawk and yellow-billed cuckoo potentially occur along this portion of the proposed route. The habitat descriptions and general locations of these species are the same as described for the Mojave Desert region of the Mojave Mainline.

The Mohave ground squirrel has been previously described under the Mojave Desert Region of the Mojave Mainline. The proposed El Dorado Mainline would cross approximately 58 miles of this habitat. Ground surveys in June-July 1986 confirmed the presence of Mohave ground squirrels along this alignment.

The desert tortoise has been described under the Mojave Desert Region of the Mojave Mainline. Berry [1984] has delineated specific habitat sites according to density for the Mojave Desert of California. Based on this information, the proposed route crosses 12 miles of high density habitat (100-250 tortoise/mi^2), 34 miles of moderate density habitat (50-100 tortoise/mi^2) and 53 miles of low density habitat (20-50 tortoise/mi^2). Besides these identified concentration sites, the desert tortoise may occur anywhere along the proposed route within this region.

The desert bighorn sheep has been described in Mojave Desert Region of the Mojave Mainline. The proposed El Dorado Mainline crosses approximately 24 miles of desert bighorn habitat in the Sacramento, Marble and Bristol mountains [BLM, 1980]. The proposed route also crosses three areas that have been identified as migration corridors: between the Chemehuevi and Sacramento mountains, between the Piute and Old Woman mountains, and between the Marble and Granite mountains [BLM, 1980].

Tehachapi Mountains Region (MP 223-255)

General Wildlife. Wildlife habitats and characteristic general wildlife along the proposed route are the same as described for the Tehachapi Mountain region of the Mojave Mainline.

Wildlife Species of Special Concern. The same species of special concern occur along the proposed El Dorado Mainline as described for the Tehachapi Mountain region of the Mojave Mainline. Differences in distribution do occur along this route for the California condor and the Tehachapi slender salamander due to minor route differences. The proposed route through the Tehachapi Mountains is completely within condor essential habitat, but is not near the condor critical habitat at Tejon Ranch [BLM, 1984b]. Tehachapi slender salamander habitat is limited to one discrete area of suitable habitat along this alignment (0.2 mi).

San Joaquin Valley Region (MP 255-324.3)

General Wildlife. Wildlife habitats within this region and characteristic general wildlife occurring along the proposed route are the same as described for the San Joaquin Valley region of the Mojave Mainline.

Wildlife Species of Special Concern. The same species of special concern occur along the proposed El Dorado Mainline as described for the San Joaquin Valley region of the Mojave Mainline. The potential distributions and habitat preferences are the same for the California condor, Swainson's hawk, ferruginous hawk, tricolor blackbird and San Joaquin pocket mouse. Some differences do occur for other species and are noted below.

Approximately 27 miles of this proposed line traverses suitable blunt-nosed leopard lizard habitat from the vicinity of the California Aqueduct to the terminus west of the South Belridge Oil Field. Ground surveys conducted during June-July 1986 identified one population of six individuals along the proposed route within suitable habitat.

Ground surveys during June-July 1986 indicate suitable habitat for the San Joaquin kit fox is present along this proposed route from the vicinity of the California Aqueduct to the terminus west of the South Belridge Oil Field (approximately 34 miles). Two active natal dens and 58 diurnal dens were observed in close proximity to the proposed route within the suitable habitat, and kit fox were seen nightly during spotlighting routes along this segment of the alignment.

Suitable habitat for the giant kangaroo rat is crossed by 11 miles of the proposed alignment. Ground surveys during June-July 1986 did not identify any active colonies in the vicinity of the proposed pipeline between the California Aqueduct and the terminus of the proposed route.

The final 36 miles of this proposed route traverses potential habitat for the short-nosed kangaroo rat. Ground surveys during June-July 1986 did not identify any active burrow systems within the vicinity of the proposed alignment within this potential habitat.

Suitable habitat for the Tipton kangaroo rat is limited along this alignment. One location along approximately six miles of the proposed route has been identified by Williams [1985] as supporting Tipton kangaroo rats. Two other small areas along the proposed route (total of two miles) have been described by Williams [1985] as areas of potential occurrence.

The proposed route would traverse approximately 34 miles of Nelson's antelope squirrel range from the vicinity of the California Aqueduct north to its terminus. Suitable habitat is found along approximately 30 miles of the proposed alignment. Ground surveys during June-July 1986 sighted 20 squirrels along this segment of the proposed route.

3.4.7.2.3 East Delivery Lateral

General Wildlife. Wildlife habitats and characteristic general wildlife along the proposed route are the same as described for the San Joaquin Valley region of the Mojave Mainline.

Wildlife Species of Special Concern. The same species of special concern occur along the proposed El Dorado Mainline as described for the Kern Lateral of the Mojave Mainline. The potential distributions and habitat preferences are the same for the California condor, ~~Swainson's hawk, ferruginous hawk,~~ tricolor blackbird, mountain plover, Tipton kangaroo rat and San Joaquin pocket mouse. Some differences do occur for other species and are noted below.

Suitable San Joaquin kit fox habitat occurs along approximately eight miles of this alignment south of Bakersfield, California. Kit fox were observed nightly during spotlighting routes through this suitable habitat. Kit fox may also occur along the proposed route north of the Kern River in the oil lease area of Oildale. Four possible diurnal dens were observed along the proposed route in this area during a helicopter survey; however, the high level of human activity and densely packed oil extraction facilities may limit their abundance.

Blunt-nosed leopard lizard suitable habitat is limited to approximately five miles along this alignment south of the Kern River.

3.4.7.3 Grazing

The proposed El Dorado Mainline would traverse numerous grazing allotments on private, state and public land. Most of the public allotments are held by the BLM. Detailed information on public and some of the private grazing allotments along the proposed route is found in Appendix D. Specific information on state allotments is not known or is incomplete because state lands are often grazed in conjunction with federal and/or private lands.

The El Dorado Mainline would cross three sheep and three cattle BLM allotments consisting of ephemeral and permanent range varying in size from 640 to 451,617 acres. The North Receipt Lateral would traverse the same grazing allotments as the Mojave Transfer Line (see Section 3.1.7.3), while the East Delivery Lateral would traverse grazing discussed under the Kern Lateral of the Mojave Proposal (see Section 3.1.7.3).

3.4.8 Socioeconomics

3.4.8.1 Population, Housing, and Economic Characteristics

From the perspective of socioeconomic analysis, the affected environments for the Mojave and El Dorado proposals are identical. The reader should refer to Section 3.1.8.1.

3.4.8.2 Traffic

Refer to Section 3.1.8.2 for a general discussion of transportation corridors.

The North Receipt Line Lateral is within Mohave County, Arizona, and runs north to south between the Transwestern pipeline and the El Dorado Mainline. Table 3.4-6 shows the major road crossings of this route.

The El Dorado Mainline including the West Delivery Lateral is within Mohave County, Arizona, and San Bernardino and Kern Counties, California. There are numerous crossings of small roads, especially in Kern County, California. No attempt was made to count these crossings. In addition to major aqueduct crossings included in Table 3.4-6, there are a number of canals in Kern County, not all of which are named, which will be crossed.

The East Delivery Lateral is entirely within Kern County. Several state highways are crossed and there are numerous crossings of smaller county and local roads which were not specifically counted. Major crossings are shown in Table 3.4-6.

3.4.8.3 Noise

Reasonable estimates of the general relationship between population density and existing average day-night noise levels (L_{dn}) are shown in Table 3.1-17. El Dorado does not propose to construct a compressor station to transport the natural gas to Bakersfield. Thus, there will be no permanent noise generating facilities in the proposed El Dorado Project.

Table 3.4-6

TRANSPORTATION CORRIDOR CROSSINGS, EL DORADO PIPELINE PROPOSAL

Pipeline Component	County, State	U.S. Interstate	U.S. Federal	State	County & Local	Railroads 1/	Aqueducts
North Receipt Line	Mohave, AZ	-	-	AZ 95(2)	2	-	-
Mainline	Mohave, AZ	I-40	-	-	-	-	-
	San Bernardino, CA	I-40(2), I-15	US 95	CA 58(2), 247	4	AT&SF(2)	-
	Kern, CA	I-5	-	CA 14,202(2), 99, 33(2)	many	AT&SF/US Govt. SP, Sunset(2)	LA Aqueduct and LA Aqu. Arvin Edison Canal, New Rim Ditch (2), CA Aqueduct
Alternative A	San Bernardino, CA	I-40	US 66	-	2	AT&SF(3)	-
Alternative B	Kern, CA	-	-	CA 202	10+	-	-
Alternative C	Kern, CA	-	-	-	3+	-	-
East Delivery Lateral	Kern, CA	-	-	CA 58,178, 184,223	many	AT&SF/SP	-

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1/ AT&SF = Atchison & Topeka and Santa Fe
SP = Sunset Pacific

3.4.8.4 Recreational Resources

The mainline begins within the Havasu National Wildlife Refuge on the Colorado River. Although the principal function is wildlife habitat, particularly for waterfowl, there are some recreational uses such as birding and hiking. Throughout San Bernardino County the mainline passes through arid desert lands having dispersed recreational resources. Near MP 152 the proposed pipeline passes through the northern portion of the Stoddard Valley Recreational Vehicle Area. This 114,000 acre parcel of varied terrain is designated for use by recreational off-road vehicles anywhere in the area.

In Kern County, the proposed mainline passes within one half mile of a Kern County park in Boron (MP 71). The park's northern boundary is within 1000 feet and its southern boundary is less than 300 feet from the proposed route. A dirt road and existing pipelines are immediately south of the proposed route. The park is 10 acres in size with 3.8 acres in grass. There are barbecue pits, picnic tables, a sheltered picnic area, restrooms, a recreation building, tennis courts, a concession stand, baseball and softball diamonds, and drinking fountains [Coyle, 1986]. The Pacific Crest National Scenic Trail is crossed in Cameron/Oak Creek Canyons. (See Section 3.1.8.4 for more information about the trail.) No designated recreational sites are within the study corridor in the western portions of Kern County.

3.4.9 Land Ownership/Use

El Dorado's proposed North Receipt Lateral, Mainline, and East Delivery Lateral, and Alternatives A, B, and C consist of approximately 470.0 miles of land crossed in Arizona and California. The lines would traverse one county in Arizona (Mohave) and two in California (San Bernardino and Kern). Table 3.4-7 shows the approximate number of miles crossed in each county and the land ownership status. The land ownership categories include private, BLM, state, FWS-NWR, and DOD. The approximate locations of land controlled by each of the different entities are shown on Map 2 in Volume IV. The land uses for the proposed El Dorado project have been determined from documents by the controlling entity, conversations with the land managers, and/or visual inspection. Land uses by county are presented in Table 3.4-8. Refer to Table 3.1-20 for rules, regulations, and policies.

The proposed North Receipt Lateral begins in Mohave County, Arizona, at approximately MP 642.3 of Transwestern's mainline. It essentially follows the proposed route of Mojave's Transfer Line (refer to Section 3.1.9.1) except for the first two miles where it is within 0.0-0.5 mile of the Mojave line. The land ownership and use remain the same for both proposed routes. The route would pass within 100 feet of a commercial building around Golden Shores.

Table 3.4-7

LAND OWNERSHIP, EL DORADO PIPELINE PROPOSAL

Pipeline Component	County, State	Total	Private		BLM		State		DOD		USFWS-NWR	
			Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
North Receipt Lateral	Mohave, AZ	16.5	1.5	(9)	8.0	(48)	2.0	(12)	-	-	5.0	(30)
Mainline	Mohave, AZ	1.3	0.2	(14)	-	-	-	-	-	-	1.1	(86)
	San Bernardino, CA	184.0	67.6	(37)	110.5	(60)	1.2	(1)	3.7	(2)	1.0	(1)
	Kern County, CA	139.0	120.2	(87)	2.4	(2)	-	-	16.4	(12)	-	-
Subtotal		324.3	188.0	(58)	112.9	(35)	1.2	-	20.1	(6)	2.1	(1)
East Delivery Lateral	Kern, CA	35.8	35.8	(100)	-	-	-	-	-	-	-	-
Alternative A	San Bernardino, CA	75.4	22.8	(30)	52.6	(70)	-	-	-	-	-	-
Alternative B	Kern, CA	8.3	8.3	(100)	-	-	-	-	-	-	-	-
Alternative C	Kern, CA	5.6	5.6	(100)	-	-	-	-	-	-	-	-

BLM = Bureau of Land Management

DOD = Deparment of Defense

USFWS-NWR = Fish and Wildlife Service - National Wildlife Refuge

Table 3.4-8

LAND USE, EL DORADO PIPELINE PROPOSAL

Pipeline Component	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	%	Irrigated/ Non-Irrigated Agriculture Miles	%	Commercial/ Industrial Miles	%	Residential Miles	%	Other Miles	%
North Receipt Lateral	Mohave, AZ	16.5	-	-	-	-	1.4	(8)	4.7	(28)	10.4 [1]	(63)
Mainline	Mohave, AZ	1.3	-	-	-	-	-	-	-	-	1.3 [1]	(100)
	San Bernardino, CA	184.0	143.0	(78)	22.0	(12)	5.0	(3)	10.0	(5)	4.0 [2]	(2)
	Kern, CA	139.0	72.6	(52)	50.0	(36)	-	-	-	-	16.4 [2]	(12)
Subtotal		324.3	215.6	(67)	72.0	(22)	5.0	(2)	10.0	(3)	21.7	(7)
East Delivery Lateral	Kern, CA	35.8	13.8	(39)	18.0	(50)	-	-	4.0	(11)	-	-
Alternative A	San Bernardino, CA	75.4	75.4	(100)	-	-	-	-	-	-	-	-
Alternative B	Kern, CA	8.3	3.8	(46)	-	-	-	-	4.5	(54)	-	-
Alternative C	Kern, CA	5.6	5.6	(100)	-	-	-	-	-	-	-	-

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[1] wildlife habitat

[2] Department of Defense

The mainline would begin its westerly journey in Mohave County, Arizona, at its dual metering station to be located on the same privately owned land that the proposed Mojave MJ-1 Compressor Station would be located. This 40-acre parcel of private land is surrounded by the Havasu National Wildlife Refuge (NWR) on three sides and state land on the ~~other~~ east. The mainline then passes through a little over a mile of Havasu NWR and traverses the unincorporated town of Topock. It would pass within 100 feet of three residences in this area. The mainline is proposed to cross the Colorado River by installing an aerial span near the old U.S. Highway 66 bridge.

In San Bernardino County, California, the El Dorado Mainline traverses another mile of the Havasu NWR. From the NWR the mainline follows a small portion of the BLM Yuma District Utility Corridor No. 3 before entering the BLM California Desert Conservation Area (CDCA). The Chemehuevi Mountains Addition WSA (AZ-050-3) is just south of the line at this point. In the CDCA it follows the designated utility corridors G and H. From the Colorado River to Highway 95 the Chemehuevi Mountains WSA is south of the proposed route. Proceeding west, the pipeline is still within corridors G and H with the Sacramento Mountains WSA to the north and Stepladder Mountains WSA to the south (MP 18-31). Between MP 32 and 41 the Piute Peak WSA is on the south and Piute Mountains WSA to the north. At approximately MP 40 the pipeline goes into utility corridor G. From MP 51-65 the Clipper Mountains WSA is to the north and Marble Mountains WSA to the south ~~to~~ between MP 51-70. From MP 71-77 the Bristol Mountains WSA is to the south and from MP 77-90 the Lava Hills WSA is to the south. From MP 90-100 Bristol/Granite Mountains WSA is on the north. Around the small village of Pisgah the proposed route would pass within 0.5 mile of the Pisgah Lava Beds Research Natural Area. Hectorite, a unique mineral, is mined in this area (MP 111). It passes through about one mile of SCS-designated prime farmland around MP 130.0. The Newberry Mountains WSA is located south of the proposed route from approximately MP 128-138.5. To the north of the same area the land use is scattered irrigated agriculture with some residential. The line would pass within 100 feet of homes at MP 125, 131, and 142. The house at MP 131 is in the Newberry Springs residential area and the two at 142 are in the Daggett area. At about MP 143.5 the pipeline would enter the Marine Corps Firing Range for three miles. Between MP 156-159 it passes through a mile of SCS-designated prime farmland. At approximately MP 181 it would cross 0.5 mile of Edwards Air Force Base. The pipeline would leave San Bernardino County at MP 186.5.

In Kern County, California, the proposed El Dorado mainline would again traverse Edwards AFB from MP 190.0-~~211.5~~ 206.0. At MP 221.0 it would cross the Los Angeles Aqueduct. Between MP 234 and 244 the route would pass within 100 feet of 13 houses. Also between MP 230, the start of the West Delivery Lateral, and 243 it would traverse about seven miles of SCS prime farmland and from MP 240-242 it would be within 0.5 mile of the California

Correctional Institute. The proposed route traverses El Tejon Ranch for four miles beginning at MP 254. Between MP 256 and 258.5 the land is classified SCS prime farmland. From MP 257-258.5, vineyards are located to the north and south of the pipeline. Between MP 258.5 and 266 it is within 0.5 mile of several orchards and vineyards and is also within 100 feet of seven homes. Farmland on which annual crops are grown is located on both sides of the pipeline from MP 266-288. At MP 284 it is within 100 feet of one house. The land use from MP 288-312 is grazing within oil fields. Alfalfa, a perennial crop, is grown between MP 312-321. Cotton, an annual, is grown for the next two miles and the last mile is grazing within oil fields.

El Dorado's East Delivery Lateral begins at MP 256.0 of the mainline. In the first mile the lateral passes within 50 feet of an almond orchard and in the first five miles nine houses are within 100 feet. From MP 0-9 the land is SCS-designated prime farmland. The route would traverse annual crop farmland from MP 9.5-14, then about a mile and half of grazing land. For the next mile a citrus orchard is located in the west side of the route and a vineyard and orchard on the east. About one mile of agricultural land is then traversed with an orchard on the west and vineyard on the east for the next 0.5 mile. From MP 17 to the end land use is grazing within oil fields. From MP 19-23 it is within the city limits of Bakersfield; this area is zoned R-1, providing the potential for single-family residential development.

3.4.10 Cultural Resources

3.4.10.1 Archaeology

See Section 3.1.10.1 for a discussion of methods, site significance, and the criteria used for assigning pipeline route sensitivity ratings.

The cultural resources of the mile-wide corridors centered on the proposed routes are presented in two tables which summarize numbers of sites and their National Register status and data on site types (see Tables 3.4-9 and 3.4-10). The data in these tables reflect the information available as of April 1986.

At least 75 surveys have been conducted within or partially within the mile-wide analysis corridor of the mainline (including the North Receipt Lateral) whose length is 340.8 miles. Approximately 60.18 miles (17.7 percent) of the proposed construction ROW has been covered by previous surveys, including 45.3 miles by the Celeron/All American Pipeline Intensive Survey, 0.5 mile by the All American Sample Survey, 2.75 miles by a pipeline survey in the Needles area [Leonard 1978], and 10.85 miles by various tract, wind farm and watershed surveys. Another 30.5 miles of survey occurred directly adjacent to (perhaps partially covering) the construction ROW. The Celeron/All American intensive survey accounted for 22.15 miles of these surveys.

Table 3.4-9

KNOWN CULTURAL RESOURCE SITES, EL DORADO PIPELINE PROPOSAL

	Sites and National Register Status 1/			
Pipeline Segment (State)	Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
North Receipt Lateral (Arizona)	-	-	-	1
El Dorado Mainline (California/AZ)	1	2/0	1 2/	132
East Delivery Lateral (California)	-	-	-	2
Total Sites	1	2/0	1 2/	135

1/ National Register status refers only to the results of official determinations. Many other sites may meet the eligibility criteria but they have not been formally evaluated. In addition, four sites are California Historical Landmarks, two along the Mainline and two along the East Delivery Lateral. Two sites on the Mainline are also listed on the California Inventory of Historical Resources.

2/ This site has been destroyed.

Table 3.4-10

KNOWN CULTURAL RESOURCES TYPES, EL DORADO PIPELINE PROPOSAL

Type	North Receipt Lateral	El Dorado Mainline	East Delivery Lateral
Camp	(1)	4(6)	-
Habitation with Bedrock Mortars	-	3	-
Habitation?	-	(4)	-
Scatters			
Lithic	1	40(6)	-
Lithic+Midden	-	1	-
Groundstone	-	1	-
Lithic+Ceramic	-	2(1)	-
Lithic+Groundstone	-	2(2)	-
Fire altered rock	-	1	-
Lithic+Fire a.r.	-	7	-
Lithic+Ceramic+ groundstone	-	2	-

Table 3.4-10 (continued)
KNOWN CULTURAL RESOURCES TYPES, EL DORADO PIPELINE PROPOSAL

Type	North Receipt Lateral	El Dorado Mainline	East Delivery Lateral
Scatters (continued)			
Lithic+groundstone+ fire altered rock	-	1	-
Bedrock Mortar(s)	-	6(1)	-
Bedrock Mortar(s) + Lithics	-	7(1)	-
Milling	-	2	-
Hearth(s)	-	3	-
Hearth(s) and Lithics	-	3	-
Rock Alignment	-	2	-
Rockshelter	-	5	-
Quarry	-	2	-
Rockshelter+Quarry	-	2	-
Trail	-	2	-
Intaglio	-	1	-
Water Control Devise	-	1	-
Stone Circle	-	1	-
Midden	-	(1)	-
Wall	-	(1)	-
Isolated Find	-	4	-
Historic Features			
Historic Trash	-	(2)	-
Historic Dump	-	2(2)	-
Structures/Foundations	-	4(1)	-
Habitation+Hist. Trash	-	1	-
Bridge	-	2	-
Burial	-	1	-
Oil Well+Hist. Trash	-	2	1
Oil and Gas Development + Historic Trash	-	2	-
Oil and Gas Development + Structures (with camp)	-	3(1)	-
Oil and Gas Development + Historic Dump	-	3	-
Oil and Gas Development + Drilling Site	-	1	-
Stone Circle	-	1	-
Railroad Grade	-	1	-
Road/Trail/Pass	-	2	-
Ferry	-	-	1
Historic Town	-	1	-
Unknown	-	5	-
Total Sites	1	136	2

Figures in parentheses refer to additional instances occurring at sites already counted once in the table.

total of 137 sites have been documented for this pipeline segment, including 106 prehistoric and 26 historic sites. There are no data on five sites. The Topock or Mystic Maze (an intaglio) is listed on the National Register and is sacred to local American Indians. A large lithic scatter (KER-322) and Needles Bridge (Arizona) ~~has~~ have been determined to be eligible for the register. ~~Needles Bridge (Arizona) has been nominated to the register.~~ In addition, two sites are California Historical Landmarks: the National Old Spanish Trails Monument (#781) along the Colorado River (if it has integrity within the analysis corridor) and Oak Creek Pass (#97), an historic transportation route through the Tehachapi Mountains. Two other sites are listed on the California Inventory of Historic Resources: the town of Daggett and Foley Grave. The Needles Bridge and Red Rock Bridge (destroyed) are listed in the Arizona State SHPO files (#71 and #42).

Only two surveys have been conducted within or partially within the East Delivery Lateral of 35.8 miles. These surveys covered about 0.65 mile (1.8 percent) of the proposed construction ROW. Only two sites have been documented for this pipeline segment and they are both California Historical Landmarks: Gordon's Ferry (#137) and Discovery Well (#290). No sites are listed on, or have been determined to be eligible for, the National Register.

There are four high sensitivity pipeline segments along this route, three along the mainline and one along the East Delivery Lateral.

3.4.10.2 American Indian Concerns

Since the El Dorado and Mojave Pipeline Projects follow very similar routes through Kern and San Bernardino Counties in California and through Mohave County in Arizona, please refer to Section 3.1.10.2. The only important difference is that the proposed North Receipt Lateral in Mojave County appears to pass through only about 50-100 feet of the Fort Mojave Indian Reservation.

3.4.11 Paleontological Resources

See Section 3.1.11 for a discussion of methods, information sources, and important criteria. Table 3.4-11 identifies the significant formations along the El Dorado route and variations.

3.4.12 Visual Resources

The scenic environment of the study area is generally characteristic of the Mohave-Sonoran Desert. The landforms include valleys, hills, alluvial fans, steep mountains, and vestiges of volcanic formations. The vegetation is sparse.

Table 3.4-11
PALEONTOLOGICAL FORMATIONS, EL DORADO PIPELINE PROPOSAL

Age	Formation	Potential [1] Vertebrate/ Invertebrate	Sensitivity
NORTH RECEIPT LATERAL			
Precambrian	Granite/Gneiss	L/L	No
Quaternary	Basalt	L/L	No
Quaternary/Tertiary	Nonmarine sedimentary	L/L	No
MAINLINE WITH THE WEST DELIVERY LATERAL			
Pleistocene	Nonmarine sedimentary	L/L	No
Tertiary	Nonmarine sedimentary	L/L	No
Quaternary	Quaternary alluvium	unknown	unknown
Miocene	Hector Formation	H/L	Yes
Holocene	Holocene dune sand	H/L	Yes
Miocene	Tropico Group	H/L	Yes
Quaternary	Quaternary lake deposits	H/L	Yes
Holocene	Holocene alluvial fan deposits	L/L	No
Upper Miocene	Chanac Formation	H/L	Yes
Middle Miocene	Round Mountain silt	H/L	Yes
Upper Miocene	Santa Margarita Formation	H/H	Yes
Holocene	Holocene basin deposits	L/L	No
Pliocene Lower Pleistocene	Tulare Formation	H/L	Yes
Quaternary	Quaternary asphalt deposits	H/L	Yes
EAST DELIVERY LATERAL			
Holocene	Holocene alluvial fan	L/L	No
Pleistocene	Pleistocene nonmarine sedimentary	L/L	No
Uppermost Miocene	Kern River Formation	H/L	Yes
Holocene	Holocene stream channel	L/L	No
ALTERNATIVE A			
Pleistocene	Pleistocene nonmarine sedimentary	L/L	No
Miocene	Miocene nonmarine sedimentary	H/L	Yes
Quaternary	Quaternary alluvium	unknown	unknown
ALTERNATIVE B			
Quaternary	Igneous/metamorphic	L/L	No
Quaternary	Quaternary alluvium	L/L	No
ALTERNATIVE C			
Holocene	Holocene alluvial fan	L/L	No
Quaternary	Quaternary alluvium	L/L	No
Quaternary	Igneous/metamorphic	L/L	No

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[1] L = Low, H = High

The color of the desert landscape ranges from dark grays and browns to light tans, and light green. Textures are medium to coarse for the mountain/hill areas and smooth to fine for the alluvial fan and wash area.

Man-made features become more dominant in urbanized areas and centers such as Barstow and Bakersfield. There are no known architectural structures of scenic significance.

There are two state designated scenic highways in the study area: Highway 58 from Barstow to Inyo County, and State Highway 247 from Barstow to Highway 62.

The BLM has categorized the scenic resources within the Mojave Desert. The predominant visual resource management classes in the study area as a whole are Class II and Class III. The predominant scenic quality is not exceptional and falls into Classes B and C.

Refer to Section 3.2.12 for the methodology employed in describing visual resources.

3.4.12.1 North Receipt Lateral

MP 0-10.7, VRM/VQO: Not Applicable
Description: Havasu National Wildlife Refuge. The landforms include bottomland, drainage areas, and Colorado River high water zones. The vegetation consists of various riparian species including cottonwood, willow, and mesquite. Modifications include an underground pipeline corridor which the proposed route follows.

3.4.12.2 El Dorado Mainline

MP 0-1.5, VRM/VQO: Not Applicable
Description: Colorado River Crossing. The landform consists of steep rocky banks on both shores of the Colorado River. The vegetation consists of various riparian species including willow and mesquite. Modifications include three pipeline crossings and unpaved access roads, a railroad bridge, and the Interstate 40 bridge.

MP 1.5-7.3, VRM/VQO: BLM Class IIA
Description: Chemehuevi Mountain Foothills. The landform consists of steeply sloping smooth foothills in transition to gently sloping flat terrain. The vegetation consists of creosote bush scrub. Modifications include an underground pipelines corridor which the proposed route follows and pipeline access roads.

MP 7.3-9.8, VRM/VQO: BLM Class IIB
Description: Chemehuevi Mountain Foothills. The landform consists of steeply sloping smooth foothills in transition to gently sloping flat terrain. The vegetation consists of creosote bush scrub. ~~Modifications include underground pipelines corridor which the proposed route follows and pipeline access roads.~~

MP 18.8-22.8, VRM/VQO: BLM Class IIA
Description: Stepladder Mountains WSA. The landform consists of small, rocky hills. The vegetation consists of creosote bush scrub. ~~Modifications include underground pipelines which the proposed route follows and existing pipeline access roads.~~

MP 35.8-37.3, VRM/VQO: BLM Class IIB
Description: The landform consists of lower mountain foothills and sloping desert terrain. The vegetation consists of creosote bush scrub. Modifications include existing pipelines which the proposed route follows, abandoned mines and mine roads.

MP 50-61, VRM/VQO: BLM Class IIA, IIB
Description: Clipper Mountains WSA. The landform consists of steep sloping foothills of the 3,800 foot range. The vegetation consists of creosote bush scrub. Modifications include abandoned mines and mine roads.

MP 61-68.2, VRM/VQO: BLM Class IIA, IIB
Description: Marble Mountains WSA. The landform consists of a gently sloping to smooth pass through the 3,600 foot range. The vegetation consists of creosote bush scrub. No modifications are present. An existing underground pipeline is within 0.5 miles of this section.

MP 68.2-74.7, VRM/VQO: BLM Class IIB
Description: Bristol Mountains WSA. The landform consists of steep slopes and rough mountain terrain with rock outcrops. The vegetation consists of creosote bush scrub. Modifications include jeep trails, and roads. An existing underground pipeline is within 0.5 miles of this section.

MP 235.5-236, VRM/VQO: Not Applicable
Description: Pacific Crest Trail. The landform consists of gently rolling ridgelines in the low Sierra Mountains foothills. The vegetation consists of low elevation pine and creosote bush scrub. Modifications include extensive wind farms, access roads, grazing lands, and existing underground pipelines would be followed.

3.5 EL DORADO ROUTE ALTERNATIVES

Material presented below is limited to a description of environmental characteristics associated with each route variation where these characteristics are unique or differ significantly from those associated with the proposed route. The reader is referred to Section 3.4 for information on topics not addressed under a particular route variation.

3.5.1 Alternative A

3.5.1.1 Air Quality

Refer to Tables 3.1-1 and 3.1-4A for baseline information applicable to Alternative A.

3.5.1.2 Geology

Alternative A would traverse the same geologic conditions as discussed for the Mojave Mainline (MP 37-110) in Section 3.1.2.2. Table 3.4-1 lists the various geologic features that would be encountered along the route. The route would pass by two unique geologic features: Amboy Crater (MP 40) and the Marble Mountain Fossil Bed (MP 22).

3.5.1.3 Soil

The soils that would be traversed by Alternative A (MP 0-75.4) are listed and described by milepost in Appendix A. The soils that would be traversed by this alternative are the same as described for MP 37 to MP 110 of the Mojave Mainline as discussed in Section 3.1.3.2.1.

3.5.1.4 Surface Water

Alternative A would cross approximately 10 ephemeral to intermittent streams within the Mojave River basin. No significant surface water resources occur along the route of this alternative.

3.5.1.5 Groundwater

The groundwater conditions in the vicinity of Alternative A are the same as those described for alluvial valleys in Section 3.1.5 of the Mojave proposal.

3.5.1.6 Freshwater Biology

Alternative A would traverse the same ephemeral drainages and washes within the Mojave Desert region as the Mojave Mainline MP ~~38-115~~ 37-110. No major perennial aquatic habitat occurs along the route. The productivity and diversity of the ephemeral drainages that would be crossed are typically inhibited by excessive suspended sediments, rapidly fluctuating flows with dry periods, undesirable algal growths, and high stream temperatures [Stephenson, 1984].

3.5.1.7 Terrestrial Biology

3.5.1.7.1 Vegetation

General Vegetation. Introductory comments made in Section 3.1.7.1 for the Mojave Desert region also apply to this alternative. Alternative A would predominantly traverse Mojavean creosote bush scrub. Table 3.5-1 lists the distribution of vegetation along the route.

Plant Species of Special Concern. Five species of special concern may occur in areas and habitat traversed by the route. All five are species of concern to the CNPS and four are federal candidate species. Appendix C lists and describes these species.

Table 3.5-1

VEGETATION COMMUNITY TYPES,
EL DORADO ALTERNATIVES

Project Alternative	Geographic Region	Community Type	Milepost
A	Mojave Desert	Mojavean creosote bush scrub	0.0-75.4
B	Tehachapi Mtns.	Agricultural land	0.0-1.0
		Digger pine-oak woodland	1.0-8.3
C	Tehachapi Mtns.	Digger pine-oak woodland	0.0-5.0
		Valley and foothill grassland	5.0-5.6

3.5.1.7.2 Wildlife

General Wildlife. Wildlife habitats and characteristic general wildlife along the route are the same as described for the upland habitats of the Mojave Desert region of the Mojave Mainline.

The route crosses approximately 18 miles of potential golden eagle nesting habitat [BLM, 1980]. These sites occur within the Marble and Bristol mountains.

Wildlife Species of Special Concern. The Gila monster, Swainson's hawk, ferruginous hawk and yellow-billed cuckoo potentially occur along this portion of the route. The habitat descriptions for these species are the same as described for the Mojave Desert region of the Mojave Mainline.

The desert tortoise has been described under the Mojave Desert region of the Mojave Mainline. Berry [1984] has delineated specific habitat sites according to density for the Mojave Desert of California. Based on this information, the route crosses approximately nine contiguous miles of low density habitat (20-50 tortoise/mi^2). In addition to this identified concentration site, the desert tortoise may occur anywhere along the alternative within this region.

3.5.1.7.3 Grazing

Alternative A would traverse one sheep and two cattle allotments managed by the BLM. In addition, 34 miles of private land would be traversed by this alternative pipeline route. This alternative is identical to the proposed segment of the Mojave Mainline from MP 39 to 115 (see Section 3.1.7.3).

3.5.1.8 Socioeconomics

3.5.1.8.1 Population, Housing, and Economic Characteristics

See Section 3.1.8.1.2 for a general discussion of San Bernardino County.

3.5.1.8.2 Traffic

Alternative A is within San Bernardino County and runs south of the proposed mainline. Major county roads were counted, but smaller roads and trails were not included in Table 3.4-6.

3.5.1.8.3 Noise

Reasonable estimates of the general relationship between population density and existing average day-night noise levels (L_{dn}) are shown in Table 3.1-17.

3.5.1.8.4 Recreational Resources

Throughout the route there are no designated recreational sites. At the junction of Alternative A and the mainline near Pisgah, there is a BLM Special Area encompassing lava beds. While there are no tourist facilities per se, the unique mineral hectorite may be sought by rock collectors.

3.5.1.9 Land Ownership/Use

El Dorado's Alternative A follows the Mojave Mainline from Mojave MP 39-115.0. Refer to Section 3.1.9.2.

3.5.1.10 Cultural Resources

3.5.1.10.1 Archaeology

The cultural resources data for this and all other alternatives to the El Dorado proposal are presented in Tables 3.5-2 and 3.5-3 which summarize numbers of sites and their National Register status and numbers of site types.

Eleven surveys have been conducted within or partially within the analysis corridor of Alternative A whose length is 75.4 miles. None of these surveys covered the proposed construction ROW, but 5.25 miles of the Celeron/All American sample and intensive surveys were directly adjacent to (perhaps partially covering) the ROW. A total of 25 sites have been documented for this alternative route, including 20 prehistoric and five historic sites. None of these sites is listed on, or has been determined to be eligible for, the National Register. One site, the historic town of Bagdad, is listed in the California Inventory of Historic Resources.

There is one high sensitivity pipeline segment along this route.

Table 3.5-2

KNOWN CULTURAL RESOURCE SITES, EL DORADO ALTERNATIVES

Pipeline Segment (State)	Sites and National Register Status [1/] Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
Alternative A	-	-	-	25
Alternative B	-	-	-	-
Alternative C	-	-	-	29

[1/] National Register status here refers only to the results of official determinations. Many other sites may meet the eligibility criteria but they have not been formally evaluated. In addition, one site for Alternative A is listed in the California Inventory of Historic Resources.

Table 3.5-3

KNOWN CULTURAL RESOURCE TYPES, EL DORADO ALTERNATIVES

Type	Alternatives A	 B	 C
Habitation+Bedrock Mortars	-	-	1
Scatters			
Lithic	15	-	1
Lithic+Ceramic	-	-	(1)
Features			
Bedrock Mortar(s)	-	-	20
Bedrock Mortar(s)+Lithics	-	-	5
Milling	-	-	1
Milling+Lithics	-	-	1
Rock Alignment	2	-	-
Rockshelter	2	-	-
Isolated Find	1	-	-
Historic Features			
Historic Trash	1	-	-
Historic Dump	1	-	-
Historic Structure	1	-	-
Railroad Grade	1	-	-
Historic Town	1	-	-
Total Sites	25	0	29

Figures in parentheses refer to additional instances occurring at sites already counted once in the table.

3.5.1.10.2 American Indian Concerns

See Section 3.4.10.2 for a discussion of American Indian concerns. There are no specific concerns regarding Alternative A.

3.5.1.11 Paleontological Resources

See Table 3.4-11.

3.5.1.12 Visual Resources

MP 18.3-22.3, VRM/VQO: BLM Class IIA
Description: Cadiz Summit/Marble Mountains. The landform consists of gently sloping to flat terrain. The vegetation consists of creosote bush scrub. Modifications include an underground pipeline which the route follows and existing pipeline access roads.

MP 22.3-32.3, VRM/VQO: BLM Class IIIB
Description: Bristol Mountains. The landform consists of gently sloping, flat terrain. The vegetation consists of creosote bush scrub. Modifications include an underground pipeline which the proposed route follows and existing pipeline access roads.

MP 32.3-36.9, VRM/VQO: BLM Class III
Description: Lava Hills Wilderness Study Area. The landform includes Amboy Crater, ancient lava flows and transitional desert terrain. The vegetation consists of the creosote bush scrub. Modifications include an existing natural gas pipeline which the alternative would follow.

3.5.2 Alternative B

3.5.2.1 Air Quality

Refer to Section 3.1.1 and Tables 3.1-1 and 3.1-3 for baseline information applicable to Alternative B.

3.5.2.2 Geology

Geology and Physiography. Alternative B would traverse the south side of Bear Valley, one of several small uplifted alluvial basins in the Tehachapi Mountains. Bear Mountain bounds the north side of Bear Valley. The topography is low to high relief with gentle slopes in the valley and steep slopes in the mountainous region. The geology consists of Quaternary alluvial fan deposits and Mesozoic granites [Smith, 1964].

Seismicity and Faulting. The seismicity is moderate to high and is related to the Tehachapi Mountains. The Kern County earthquake of 1952 ruptured the White Wolf fault just west of the proposed route [Livingston and Associates/Moore and Taber, 1979]. Bear Mountain is bounded on the north and south by faults which have been mapped as "pre-Quaternary" [Jennings, 1975]. Concealed extensions of these faults may cross the route in the Brite Valley area.

Slope Stability. Slope instabilities may exist in locally steep slopes along the proposed route.

3.5.2.3 Soil

The soils that would be traversed by Alternative B (MP 0-8.3) are listed and described by milepost in Appendix A. The characteristics of the soils that would be traversed would be the same as those described for the Tehachapi Mountains region in Section 3.1.3.2.2.

3.5.2.4 Surface Water

Alternative B would cross over 20 ephemeral streams along its route within the Buena Vista Lake Basin. No significant water resources occur along the proposed route.

3.5.2.5 Groundwater

The groundwater conditions in the vicinity of Alternative B are similar to those described for mountains and alluvial valleys in Section 3.1.5 of the Mojave Proposal.

3.5.2.6 Freshwater Biology

Alternative B would traverse only ephemeral drainages and washes within the Tehachapi Mountains region. No major perennial aquatic habitat occurs along the route. The productivity and diversity of the ephemeral drainages that would be crossed are typically inhibited by excessive suspended sediments, rapidly fluctuating flows with dry periods, undesirable algal growth, and high stream temperatures [Stephenson, 1984].

3.5.2.7 Terrestrial Biology

3.5.2.7.1 Vegetation

General Vegetation. The vegetation types that would be traversed along the route within the Tehachapi Mountains region include primarily digger pine-oak woodland and agricultural land. The agricultural land is located in Bear Valley and Cummings Valley. Table 3.5-1 lists the distribution of these types along the route.

Plant Species of Special Concern. Five federal candidate species, also of concern to the CNPS, may occur along the route of this alternative. These species include the striped adobe lily, which is listed as threatened by the State of California. Refer to Appendix C for a list of these species.

3.5.2.7.2 Wildlife

General Wildlife. Wildlife habitats and characteristic general wildlife along the route are the same as described for the Tehachapi Mountains region of the Mojave Mainline.

Wildlife Species of Special Concern. ~~The same~~ Species of special concern occurring along Alternative B ~~along the proposed El Dorado Mainline as described for the Tehachapi Mountains region of the Mojave Mainline. Differences in distribution do occur along this route for~~ include the California condor and the

Tehachapi slender salamander. The alternative route through the Tehachapi Mountains is ~~completely~~ within condor essential habitat, but is not near the condor critical habitat at Tejon Ranch [BLM, 1984b]. Tehachapi slender salamander habitat is limited to one discrete area of suitable habitat along this alignment (0.2 mi).

3.5.2.7.3 Grazing

No public grazing allotments occur along this section of the alignment.

3.5.2.8 Socioeconomics

3.5.2.8.1 Population, Housing, and Economic Characteristics

A discussion of these issues for Kern County is in Section 3.1.8.1.2.

3.5.2.8.2 Traffic

Alternative B is a short segment north of the El Dorado mainline in Kern County. One state highway and more than 10 smaller roads would be crossed (Table 3.4-6).

3.5.2.8.3 Noise

Reasonable estimates of the general relationship between population density and existing average day-night levels (L_{dn}) are shown in Table 3.1-17.

3.5.2.8.4 Recreational Resources

No designated recreational sites are within the mile-wide study corridor.

3.5.2.9 Land Ownership/Use

Alternative B begins at MP 241.0 of the El Dorado mainline. This route would pass through the Bear Valley Springs residential community for five miles. It returns to the mainline at approximately MP 251. It would pass within 100 feet of two houses between MP 244-245 and an almond orchard around MP 241.5.

3.5.2.10 Cultural Resources

The cultural resources data for this alternative of the El Dorado Project are presented in Tables 3.5-2 and 3.5-3 (see Section 3.5.1.10 describing Alternative A) which summarize numbers of sites and their National Register Status and numbers of site types.

Only one survey has been conducted within or partially within the analysis corridor for this alternative route of 8.3 miles. This survey covered about .15 mile (3.0 percent) of the proposed construction ROW. No cultural resources have been documented for this alternative route.

See Section 3.4.10.2 for a discussion of American Indian concerns. There are no specific concerns regarding Alternative B.

3.5.2.11 Paleontological Resources

See Table 3.4-11.

3.5.2.12 Visual Resources

No areas along Alternative B have been classified for visual resource. The land is privately owned.

3.5.3 Alternative C

3.5.3.1 Air Quality

Refer to Section 3.1-1 and Tables 3.1-1 and 3.1-3 for baseline information applicable to Alternative C.

3.5.3.2 Geology

Geology and Physiography. Alternative C would traverse the Tehachapi Mountains. The topography is of moderate to high relief with steep slopes. The geology is primarily Mesozoic granites with some Quaternary alluvial fan deposits [Smith, 1964].

Seismicity and Faulting. The Tehachapi Mountains are of moderate to high historic seismicity. The 1952 Kern County earthquake ruptured the White Wolf fault just to the northwest of Alternative C [Jennings, 1975].

Slope Stability. Slope instability may occur locally on some steep slopes.

3.5.3.3 Soil

The soils that would be traversed by Alternative C (MP 0-5.6) are listed and described by milepost in Appendix A-2. The general characteristics of the soils that would be traversed would be the same as those presented in Section 3.1.3.2.2 for the Tehachapi Mountains.

3.5.3.4 Surface Water

Alternative C would cross up to 10 ephemeral streams along its route within the Buena Vista Lake Basin. No significant water resources occur along the route.

3.5.3.5 Groundwater

The groundwater conditions in the vicinity of Alternative C are similar to those described for mountains in Section 3.1.5 of the Mojave Proposal.

3.5.3.6 Freshwater Biology

El Dorado Pipeline Alternative C would traverse only ephemeral drainages and washes within the Tehachapi Mountains region. No major perennial aquatic habitat occurs along the route. The productivity and diversity of the ephemeral drainages that would be crossed are typically inhibited by excessive suspended sediments, rapidly fluctuating flows with dry periods, undesirable algal growth, and high stream temperatures [Stephenson, 1984].

3.5.3.7 Terrestrial Biology

3.5.3.7.1 Vegetation

General Vegetation. The vegetation types that would be traversed by the route within the Tehachapi Mountain region include primarily digger pine/oak woodland and valley and foothill grassland. Table 3.5-1 lists the distribution of these types along the route.

Plant Species of Special Concern. ~~Eleven~~ Fourteen federal candidate species, also of concern to the CNPS, may occur in areas of suitable habitat along the route of this variation. These species are listed in Appendix C. Three of the species are listed by the State of California: the California jewel flower and Tulare Pseudobahia, which are endangered, and the striped adobe lily, which is threatened.

3.5.3.7.2 Wildlife

General Wildlife. Wildlife habitats and characteristic general wildlife along the ~~proposed~~ route are the same as described for the Tehachapi Mountains region of the Mojave Mainline.

Wildlife Species of Special Concern. ~~The same~~ Species of special concern occurring along ~~the proposed El Dorado Mainline~~ Alternative C ~~as described for the Tehachapi Mountain region of the Mojave Mainline. Differences in distribution do occur along this route for~~ include the California condor and the Tehachapi slender salamander. The alternative route through the Tehachapi Mountains is ~~completely~~ within condor essential habitat, but is not near the condor critical habitat at Tejon Ranch [BLM, 1984b]. Tehachapi slender salamander habitat is limited to one discrete area of suitable habitat along this alignment (0.2 mi).

3.5.3.7.3 Grazing

No public grazing allotments occur along this route.

3.5.3.8 Socioeconomics

3.5.3.8.1 Population, Housing, and Economic Characteristics

A discussion of these issues for Kern County is in Section 3.1.8.1.2.

3.5.3.8.2 Traffic

Transportation corridor crossings for Alternative C are shown in Table 3.4-6.

3.5.3.8.3 Noise

Reasonable estimates of the general relationship between population density and existing average day-night levels (L_{dn}) are shown in Table 3.1-17.

3.5.3.8.4 Recreational Resources

No designated recreational resources are located on the proposed route of Alternative C.

3.5.3.9 Land Ownership/Use

Alternative C begins at MP 248 of El Dorado's mainline and returns at MP 255.5. The land use is primarily grazing on privately owned land.

3.5.3.10 Cultural Resources

The cultural resources data for this alternative of the El Dorado Project are presented in Tables 3.5-2 and 3.5-3 which summarize numbers of sites and their National Register status and numbers of site types.

Two surveys have been conducted within or partially within the analysis corridor of this alternative route of 5.6 miles. These surveys covered 4.0 miles (71.4 percent) of the construction ROW. A total of 29 prehistoric sites have been documented for this alternative route. None of these sites are listed on, or have been determined to be eligible for, the National Register.

See Section 3.4.10.2 for a discussion of American Indian concerns. There are no specific concerns regarding Alternative C.

3.5.3.11 Paleontological Resources

See Table 3.4-11.

3.5.3.12 Visual Resources

No areas along Alternative C have been classified for visual resources. The land is privately owned.

3.6 EL PASO EXPANSION PROPOSAL

El Paso proposes to expand its existing pipeline system in Arizona. These facilities expansions would be implemented to supply either Mojave or El Dorado with natural gas. El Paso has proposed a Base Case (0/400 MMcfd), discussed below in Section 3.6.1, involving 14.8 miles of looping in two segments: Window Rock A Loop (5.8 miles) and the Navajo A Loop (9.0 miles).

El Paso states in its application that the full quantity of 400 MMcfd of natural gas is assumed to be received into El Paso's system in the Permian Basin at the Lea County, New Mexico, receipt point and other supply locations.

FERC staff alternatives involving 600 MMcfd of natural gas delivery are discussed in Section 3.6.2.

3.6.1 El Paso Expansion Proposal: Base Case

3.6.1.1 Air Quality

Along the route of the El Paso pipeline, there are two nearby PSD Class I areas (Mesa Verde National Park in ~~La Plata~~ Montezuma County, Colorado, which is located 35 miles west of Bondad Station, and the Petrified Forest National Park in eastern Arizona, which is located 25 miles south of Navajo Station). A summary of relevant air quality data from monitoring stations near the proposed project area in Arizona is shown in Table 3.1-2.

3.6.1.2 Geology

Table 3.6-1 presents the geologic and physiographic conditions along the El Paso Base Case.

Table 3.6-1

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS,
EL PASO BASE CASE

	Window Rock A (MP 118.7 - 124.5)	Navajo A (MP 156.5 - 165.5)
Geo/Phys Province	Colorado Plateau	Colorado Plateau
Geologic Unit	Sedimentary Rock	Sedimentary and volcanic rocks
Age	Tertiary, Cretaceous, Permian	Tertiary, Jurassic to Triassic
Topography	Rolling to hilly terrain with several ephemeral washes	Rugged to rolling terrain with several ephemeral washes
Comments	Well consolidated sandstones and shales	Mafic volcanic rocks and associated diatremes intersperse the area

Navajo A Loop. This segment of the proposed expansion would lie within the Colorado Plateau. The route is underlain by Jurassic and Triassic sedimentary rocks, along with Tertiary volcanic rock. Some uranium is mined along the route about 10 miles northwest of the west end of the loop [Arizona Bureau of Mines, 1969]. The proposed loop would be located along the southern end of the Black Mesa Coal Field.

Window Rock A Loop. This proposed loop would lie within the Colorado Plateau. The route is underlain by Cretaceous, Tertiary, and Permian sedimentary rocks. The route does not cross any known Quaternary faults, but a series of faults exist 10 miles to the south of the end of the loop [Dane and Bachman, 1965; Wilson et al., 1969]. Coal deposits are known to occur in the area of the proposed loop [New Mexico Bureau of Mines and Mineral Resources, 1965].

3.6.1.3 Soil

The distribution of soil mapping units along the loops of the El Paso Base Case and the characteristics of the individual soils that comprise the soil mapping units are presented in Appendix A. This information has been summarized from numerous published and unpublished soil surveys prepared by the SCS as well as information from land management agencies. The soils characteristics presented in the appendix are important to an assessment of soil impacts potentially resulting from pipeline construction, operation, and abandonment. Slope, depth class (quantity of topsoil), and texture are important factors in the evaluation of topsoil suitability for use in reclamation. Slope and texture are also important factors for evaluating erosion susceptibility of the potentially affected soils. Summary descriptions of the soils identified along each loop segment are presented below.

This proposal would traverse the Colorado Plateau region. The soils formed in material derived from sedimentary and volcanic rocks, and have often been modified by wind and water. Soil development ranges from little horizon differentiation on surfaces of recent age to soils with well developed subsoils on stable plain and plateau surfaces. Surface organic matter content is low in warm environments of low elevations, and moderate to high on cool and moist plateaus and mountains.

Window Rock A Loop. This proposed loop would lie within the Colorado Plateau region and would traverse predominantly deep soils on nearly level to rolling plains. Water erosion potential is low to moderate, and wind erosion potential is moderate to high. Reclamation potential is mostly good, with poor potential occurring on a lesser amount of sandy soils [SCS, 1981c].

Navajo A Loop. This proposed loop would lie within the Colorado Plateau region and would traverse predominantly shallow soils on basalt capped mesas and cinder cones. Water erosion potential is mostly low, with a lesser amount of moderate and high potential where short segments of steeper slopes are crossed. Wind erosion potential is low. Reclamation potential is poor due to shallow depth and coarse fragments [SCS, 1981c].

3.6.1.4 Surface Water

The El Paso Base Case would lie within the Little Colorado River USGS-designated drainage basin. The land areas that would be traversed by this looping project are characterized as being primarily semiarid. Consequently, the predominant flow regime of the streams along the proposed project ranges from ephemeral to intermittent, with only the large drainage basins containing perennial flow. When flows do occur in the ephemeral and intermittent drainages, they are usually in response to high-intensity, short-duration convective thunderstorms. The flows can be of very large discharge in the form of flash floods covering wide arroyos and washes. These channels are usually dry.

Surface water quality is generally highly saline or alkaline due to the predominance of sedimentary rock exposed, high evaporation rates, and minimal precipitation. Since flows are often in response to high intensity storms, and a large and ready source of sediment is often available, the flows are typically at carrying capacities in terms of loads carried. Even relatively constant perennial flows may be highly turbid.

Table 3.6-2 lists the major streams that would be crossed by the Window Rock A and Navajo A Loops, their flow class, and the milepost of the route where the crossing would occur.

3.6.1.5 Groundwater

Specific groundwater conditions are summarized in Table 3.6-3. General conditions along each loop of the pipeline are discussed below. In addition to the major aquifers traversed by the proposed expansion, localized areas of saturated alluvial valley fill associated with intermittent and perennial streams may be traversed by the various loops. See ~~Section 3.6.1.4~~ Table 3.6-2 for a ~~discussion on~~ list of streams that would be crossed and their location along the route of the proposed loops.

Window Rock A Loop. Groundwater occurs beneath the Window Rock A Loop in consolidated sandstones and limestones at a depth of 200 to 500 feet. Wells constructed in the bedrock units can yield in excess of 100 gallons per minute, particularly where the rock has been fractured. The quality of groundwater beneath the loop is good, with TDS concentrations generally less than 1000 milligrams per liter. However, due to the remoteness of the area, groundwater development is limited.

Navajo A Loop. The formations within which groundwater occurs beneath the Navajo A Loop are very similar to the ~~White~~ Window Rock A Loop. However, the depth to groundwater is generally greater and the quality is generally poorer below the Navajo A Loop as compared with the Window Rock A Loop. Groundwater development is limited in the area of the Navajo A Loop.

Table 3.6-2

MAJOR INTERMITTENT DRAINAGE CHANNELS, EL PASO BASE CASE AND 600 MMcfd ALTERNATIVES

Pipeline Component	Alternatives	Drainage Basin	Drainage Channel	Flow Class	MP
Blanco	600 (100/500;200/400)	San Juan	Hart Canyon	I	12.6
			Knickerbocker Canyon	I	8.1
			Calloway Canyon	I	7.3
Chaco	600 (200/400)		Gallegos Canyon	I	17.8
White Rock			Chaco River	I-P	43.9
Gallup			Red Willow Wash	I	68.4
			~~Fiquerredo Wash~~	~~I~~	~~75.4~~
Window Rock B	600 (100/500;200/400)	Little Colorado	Burned Death Wash	I	86.5
			Defiance Draw	I	100.9
			Black Creek	I-P	107.7
			Cienega Creek	I	112.4
Window Rock A	600 and Base Cases		Wide Ruin Wash	I	123.8
~~Navajo A, B~~			~~Steamboat Wash~~	~~I~~	~~158.1~~
Navajo A, B	600 (100/500;200/400)		Tesbito Wash	I	158.5
			Coyote Wash	I	175.7
			Shonto Spring	I	179.3
Leupp		Gila River	Rio de Flag	I	246.2
			Elden Spring	I	248.7
Williams A			Volunteer Wash	I	264.0
Williams B		Colorado	Cataract Creek	I	283.6
			Pine Creek	I	284.8
		Gila River	Rogers Canyon	I	293.9
Seligman	600 and Base Cases		Railroad Canyon	I	324.1
			Big Chino Wash	I	328.6
			Trib. Big Chino Wash	I	333.0
			Trib. Big Chino Wash	I	336.7
			Markham Wash	I	338.0
			Markham Wash	I	339.1
			Markham Wash	I	343.3
Hackberry		Colorado	Mackenzie Wash	I	416.5
			Happy Jack Wash	I	418.2
			Bar I-L Wash	I	418.4
			Flattop Wash	I	420.4
			Illavar Wash	I	422.9
			Buck Mountain Wash	I	426.3
			Franconia Wash	I	428.4
Laguna	600 (100/500)	Rio Grande	Grants Canyon	I	333.9 [1]

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[1] Milepost for the Permian/San Juan Pipeline

Table 3.6-3

GROUNDWATER OCCURRENCE, EL PASO BASE CASE

	Window Rock A	Navajo A
Minimum Depth to Water (ft)	200-500	>500
Total Dissolved Solids Concentration (mg/l)	<1000	>3000
Degree of Groundwater Development	low	low
References	Davidson [1979]	Davidson [1979]
Comments	No major springs	No major springs

3.6.1.6 Freshwater Biology

Window Rock A Loop. No perennial streams occur along the route of this proposed expansion; however, one intermittent stream would be crossed. No fisheries are present in this intermittent wash. Ephemeral aquatic habitats which support opportunistic species with short life cycles or adaptations for temporary habitats such as some algae, crustaceans, and insects may exist after rainy periods. No species of special concern are present.

Navajo A Loop. ~~One relatively large intermittent wash, Steamboat Wash, would be traversed by the Navajo A Loop.~~ No perennial streams would be crossed and no permanent aquatic habitats are present. Some ephemeral habitats may occur in the intermittent washes. Aquatic organisms present are typically restricted to certain specialized algae, crustaceans, insects or other taxa with short opportunistic life cycles or adaptations for withstanding extended drought periods. No species of special concern are present.

3.6.1.7 Terrestrial Biology

3.6.1.7.1 Vegetation

General vegetation along the proposed expansion was mapped according to Donart et al. [1978] and Agricultural Experiment Station, University of Arizona [1965]. Vegetation community type descriptions were developed according to MacMahon [1985] as well as personal communications with agency specialists.

The proposed El Paso Base Case Expansion would traverse the Colorado Plateau geographic region. Two vegetation types, plains grassland and pinyon-juniper woodland, occur along the proposed loop routes. Narrow zones of riparian vegetation distributed along streams may occur within these vegetation types. The distribution of the two community types along the proposed loop routes is provided in Table 3.6-4.

Table 3.6-4

VEGETATION COMMUNITY TYPES,
EL PASO BASE CASE

Loop	Geographic Region	Community Type	Approx. MP
Window Rock A	Colorado Plateau	Pinyon-juniper woodland	118.7-124.5
Navajo A	Colorado Plateau	Plains grassland	156.5-160.5
		Pinyon-juniper woodland	160.5-165.5

Although not known to occur in close proximity to the proposed loop expansions, two rare plants occur in the general area that would be traversed by the loops. These rare plants are a federally listed endangered species, Peebles Navajo cactus, and a federal candidate species, gladiator milkvetch. Appendix C lists the plants species that are of concern, their status and associated habitats, and the general location of their occurrence along the proposed routes. Peebles Navajo cactus grows within the plains grassland community type and in grassy openings within the pinyon-juniper woodland on the Shinarump conglomerate member of the Chinle Formation.

3.6.1.7.2 Wildlife

Wildlife habitats along the proposed pipeline loops for the El Paso Base Case are provided by pinyon-juniper woodland and plains grassland community types occurring at middle elevations.

Wildlife species and habitat features occurring along each proposed loop expansion are described below. Presence and distribution of wildlife species, features and habitats are based on published literature, data files of federal and state agencies, and personal communications with professional personnel familiar with the areas of concern.

Wildlife species that are listed by the U.S. Fish and Wildlife Service as threatened or endangered, and candidates for each listing are discussed for each proposed loop where appropriate. Table 3.6-5 lists species of special concern, their status and proposed loops on which they potentially occur.

Table 3.6-5

WILDLIFE SPECIES OF SPECIAL CONCERN, El PASO BASE CASE AND 600 MMcfd ALTERNATIVES

Species	Status 1/	Habitat	Loop	Pipeline Alternatives
Black-footed Ferret	FE	Grassland plains and mountain basins generally in association with prairie dog colonies.	Blanco	100/500, 200/400
			Chaco	200/400
			White Rock	200/400
			Gallup	200/400
			Seligman	100/500, 200/400
			Laguna	100/500
Bald eagle	FE	Waterways and migration corridors.	All	Base Case, 100/500, 200/400
Peregrine falcon	FE	Rocky areas with steep cliffs from 4000 to 9000 feet elevation.	All	Base Case, 100/500, 200/400
Ferruginous hawk	FC	Open grasslands.	All, except Hackberry	Base Case, 100/500, 200/400
Swainson's hawk	FC	Grasslands and open woodlands.	All, except Hackberry	Base Case, 100/500, 200/400
Mountain plover	FC	Grasslands and sagebrush scrub from middle to high elevations.	Chaco	200/400
			White Rock	200/400
			Gallup	200/400
			Window Rock A	Base Case, 100/500, 200/400
			Window Rock B	100/500, 200/400
Desert tortoise	FC AZ-3	Creosote bush scrub, desert washes and lower bajadas.	Hackberry	100/500, 200/400
Gila monster	FC	Rocky or sandy washes and outwash plains in desert environs.	Hackberry	100/500, 200/400

1/ FE = species listed as endangered by the U.S. Fish and Wildlife Service; FC = Candidate species for listing as threatened or endangered by the U.S. Fish and Wildlife Service; AZ-3= listed as Group 3 by State of Arizona.

Window Rock A Loop. This loop would only traverse the pinyon-juniper woodland community type. This habitat type supports species such as the tree lizard, sagebrush lizard, pinyon jay, Clark's nutcracker, red-breasted nuthatch, pinyon mouse, deer mouse, big brown bat, great horned owl, nighthawk, Cooper's hawk, sharp-shinned hawk, ladderback woodpecker, common flicker, gray flycatcher, and green-tailed towhee.

Federally listed endangered species which would potentially occur along the proposed Window Rock A Loop expansion are the bald eagle and peregrine falcon. These species occur only as ~~temporary~~ migrants. Federally listed candidate species potentially occurring along this proposed loop are the ferruginous hawk, Swainson's hawk, and mountain plover. At present, no nests have been identified in the vicinity of this alignment.

Navajo A Loop. Wildlife that would occur along the proposed loop expansion are characteristic of the plains grassland community type described below and pinyon-juniper woodland community type previously described for Window Rock A.

Plains grassland habitat occurs both as a mosaic with other community types along the route or as continuous grasslands in valley areas. Where the grasslands occur interspersed with other habitats, wildlife species from adjacent woodlands or desert scrub community types can potentially occur within the grassland community. In larger grassland areas common species include western meadowlark, prairie falcon, Plains pocket mouse, Gunnison's prairie dog, and pronghorn antelope.

The bald eagle and peregrine falcon are federally listed endangered species that potentially occur, mainly as migrants, along this proposed loop. Federally listed candidate species that may occur along the proposed loop include the ferruginous and Swainson's hawks. These species are generally ubiquitous in open grassland and shrub communities throughout the western United States. No nest sites have been identified along the alignment.

3.6.1.7.3 Grazing

The El Paso Base Case involves two loops which cross Bureau of Indian Affairs (BIA) land in Arizona. Appendix D lists details for grazing on each loop. Where grazing allotments are not delineated and open range exists, AUMs are not accurately documented. Therefore, only an estimate of acres per AUM is given in Appendix D.

Window Rock A Loop. This loop would cross open range on BIA land where cattle, sheep, and horses are grazed on a nearly year-round basis.

Navajo A Loop. This loop would cross open range of BIA land where cattle, sheep, and horses are grazed on a nearly year-round basis.

3.6.1.8 Socioeconomics

3.6.1.8.1 Population, Housing, and Economic Characteristics

The El Paso Base Case involves loops in Apache and Navajo Counties in Arizona. Apache County had a 1980 population of 52,108 which grew 2.2 percent to 53,200 by 1984. The county has a relatively large concentration of the population in the 0-17 age bracket compared to other counties (44.7 percent). Apache County's 1980 population had 15,454 year-round housing units available to it, of which 18.2 stood vacant. A total of only 56 motel rooms exist in the entire county. Table 3.1-13 shows population and housing data.

Unemployment is relatively high in Apache County with almost 20 percent of the workforce unemployed in late 1985. The service industry is the primary source of employment. Apache County has a very low per capita income compared to other Arizona counties. The 1983 per capita income was $5,740, while in Yavapai County it was $9,868. No major cities or towns exist in Apache County near the ROW. Table 3.1-14 provides industrial data for the county.

Navajo County is very similar in many respects to Apache County. The population in 1984 was 71,200, increasing only 5.3 percent from 1980. A relatively high portion of the population is under 18 years of age. Over 20 percent of the 22,967 year-round housing units in Navajo County stood vacant in 1980. A total of 1,395 hotel and motel rooms exist in the county near the ROW. Table 3.1-13 shows the population and housing data for the county.

Navajo County also has relatively high unemployment, with 15.4 percent of the workforce out of work in December 1985. The major industry in the county is retail and wholesale trade, with a relatively low amount of service industry. The per capita income in Navajo County is also relatively low with the 1983 estimate reported to be $7,119. Table 3.1-14 gives employment and other industrial data for the county.

Two towns of considerable size in Navajo County are within 50 miles of the pipeline: Holbrook and Winslow. Holbrook has a current population of almost 6,000 and Winslow has a current population of over 8,200. There are 748 hotel and motel rooms in Holbrook and 547 in Winslow. Holbrook's per capita income is approximately equivalent to the county average, while the per capita income in Winslow is over $1,000 higher. Table 3.1-15 includes profiles of Winslow and Holbrook.

3.6.1.8.2 Traffic

Mostly local and county roads are crossed by the two proposed loops. Table 3.6-6 gives the number of road crossings for each of the loops in the Base Case.

Table 3.6-6

TRANSPORTATION CORRIDOR CROSSINGS, EL PASO BASE CASE

Loop	State	County and Local
Window Rock A	-	0
Navajo A	AZ 77	12

3.6.1.8.3 Noise

Ambient noise levels for the El Paso Base Case were estimated using data presented in Section 3.1.8.3. Due to the remote areas slated for loop construction, ambient noise levels would be low.

3.6.1.8.4 Recreational Resources

No designated recreational sites are within the mile-wide pipeline corridor. ~~Hunting small game, hiking and off-road vehicle use comprise the informal activities.~~ Recreational opportunities on lands under the jurisdiction of the Navajo Nation are similar to those on private lands. While hiking, exploring and birdwatching may be acceptable, camping, hunting, disturbance or removal of natural and cultural resources would be prohibited, restricted or require prior permission.

3.6.1.9 Land Ownership/Use

El Paso's proposed Base Case project traverses two counties in Arizona (Apache and Navajo) for a total of 14.8 miles. Table 3.6-7 shows the approximate number of miles crossed in each county by loop segment and also shows the ownership status of the lands. Land uses by county and loop segment are presented in Table 3.6-8 and the approximate locations of each are shown on Map 3 in Volume IV. None of the proposed expansion project routes is projected to pass within 100 feet of any residences. Refer to Table 3.6-21 for policies and regulations regarding this case.

Window Rock A Loop (MP 118.7-124.5) is wholly located in Apache County, Arizona. The land traversed is controlled by the Navajo Nation and the land use is grazing.

Navajo A Loop (MP 156.5-165.5) is located in Navajo County, Arizona. It is within the boundaries of the Navajo Nation but traverses some private land which is not controlled by the Navajo Nation. The land is solely used for grazing. The county has no plans for the private land within the Navajo Nation boundaries [Placios, 1986].

Table 3.6-7

LAND OWNERSHIP, EL PASO BASE CASE

Loop	County/State	Total	Private Miles	Private %	Indian Miles	Indian %
Window Rock A 1/	Apache, Az	5.8	-	-	5.8	(100)
Navajo A 2/	Navajo, AZ	9.0	4.0	(44)	5.0	(56)
TOTAL		14.8	4.0	[27]	10.8	[73]

1/ BLM 1:500,000 Surface Management Status Maps
2/ BLM 1:100,000 Surface Management Status Maps

Table 3.6-8

LAND USE, EL PASO BASE CASE

Loop	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	%
Window Rock A	Apache, AZ	5.8	5.8	(100)
Navajo A	Navajo, AZ	9.0	9.0	(100)
TOTAL		14.8	14.8	[100]

3.6.1.10 Cultural Resources

3.6.1.10.1 Archaeology

The cultural resource data for the El Paso Base Case areas were compiled from existing environmental analyses, technical reports, and cultural resource inventories prepared for sections of the proposed pipeline route as well as for similar pipeline projects. In cases where such reports contained insufficient or outdated site and survey data for a given pipeline corridor, coverage was expanded and brought up to date. For those pipeline sections lacking documentation, a complete Class I survey was implemented for the mile-wide pipeline corridor.

The cultural resources located in the mile-wide corridors associated with the El Paso expansion loops are presented in two tables which summarize numbers of sites and their National Register status and data on site types (see Tables 3.6-9 and 3.6-10). The data in these tables reflect the information available as of April, 1986. In most instances, only small portions of the pipeline corridors have been the subject of ground surveys performed to BLM standards and as such there are large gaps in the data. The fact that some pipeline segments contain few sites frequently reflects the general lack of research in the area. Prior to actual pipeline construction, it will be necessary to conduct intensive on-the-ground surveys to ascertain the full extent of cultural resources present in the actual construction corridors. Please note that the tables in this section summarize the known cultural resources within the mile-wide corridors. The actual discussion of those sites within the proposed project construction ROWs is presented in the impact section.

The tables summarizing and interpreting the cultural resources for the El Paso Base Case Expansion Proposal are based on the data presented in some detail in the cultural resources technical report. Details on previous survey coverage and an overview of the prehistory, history, and ethnohistory of the project area are also contained in the technical report.

Table 3.6-9

KNOWN CULTURAL RESOURCE SITES,
EL PASO BASE CASE

Pipeline Loop and State	Sites and National Register Status[1/] Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
Arizona				
Window Rock A	0	0	0	0
Navajo A	0	0	0	6
Total Sites	0	0	0	6

[1/] National Register status here refers only to the results of official determinations. Many other sites may meet the eligibility criteria but have not been formally evaluated.

Table 3.6-10

KNOWN CULTURAL RESOURCE TYPES,
EL PASO BASE CASE

Type	Window Rock A	Navajo A
Scatter		
Ceramic	-	1
Lithic+Ceramic	-	1(2)
Features		
Structures	-	3
Historic Features		
Historic Dump	-	(1?)
Habitation/Structure	-	1
Total Sites	0	6

Figures in parentheses refer to additional types or instances occurring at sites already counted once in the table.

Summary. Only .05 mile (0.6 per cent) of the 14.8 miles of looping proposed for the El Paso Base Case Expansion Proposal has been covered by previous surveys done to BLM standards. (The original survey done of the entire El Paso line by Wendorf et al. [1956] was not done to BLM standards for today's field methods). A total of six cultural resource sites have been documented within the mile-wide analysis corridors of these loops. None of the sites are listed on, or have been determined to be eligible for, the National Register.

3.6.1.10.2 American Indian Concerns

In order to document such concerns, a letter explaining the proposed expansion project was sent with appropriate route maps to appropriate Indian groups and individuals. The letter specifically requested responses with regard to sacred areas, archaeological sites and their excavation, burials, and ethnographic use areas with particular reference to traditional plants and animals. When groups responded, follow-up telephone or written contacts were made. A copy of the initial letter and the list of those contacted are provided in the cultural resources technical report.

Because the proposed expansion loops traverse primarily Navajo Indian Reservation lands in New Mexico, the Navajo Tribe was contacted directly by an ethnographer who has long worked with them. He conducted interviews with numerous tribal officials at both the tribal and chapter levels. A list of those contacted is presented in the technical report.

The Navajo are very concerned about archaeological sites and their contents, sacred sites of all kinds, burial sites, and sacred traditional plants and animals. They also have well-developed written policies regarding their preservation. (See Section 4 on mitigation measures; copies of these policies have been included in the cultural resources technical report).

Some Navajo tribal and chapter representatives mentioned several additional concerns: 1) the concerned chapters wish to have a voice regarding which side of the original pipeline the proposed expansion loops would be laid; 2) chapter grazing committees are concerned about fencing and livestock control during the construction period; and 3) the construction of the pipeline should provide employment to local people.

3.6.1.11 Paleontological Resources

Paleontological resources for the El Paso Base Case (0/400 MMcfd) have been divided into two looped segments. Table 3.6-11 lists the formations for the Base Case. A detailed discussion of the significance criteria occurred in Section 3.1.11 and a detailed discussion of the paleontological resources has been provided in the Paleontologic Resource Assessment Technical Report [Morales et al., 1987].

Table 3.6-11

PALEONTOLOGICAL FORMATIONS, EL PASO BASE CASE

Age	Formation	Potential [1] Vertebrate/ Invertebrate	Sensitivity
	Window Rock A Loop		
Late Triassic	Chinle Formation	H/H	Yes
Uppermost Miocene	Bidahochi Formation	H/L	Yes
	Navajo A Loop		
Uppermost Miocene	Bidahochi Formation	H/H	Yes
Upper Triassic	Wingate Sandstone	L/L	No

---

[1] H = High, L = Low

3.6.1.12 Visual Resources

The scenic environment of the study area is generally characteristic of the upper Sonoran Desert in southern Colorado, northwestern New Mexico, and northcentral Arizona. The landforms consist of desert valleys, hills, steep mountains, and high plains. The vegetation is sparse.

The color of the upper Sonoran mountain and desert landscape ranges from dark grays, reds, and browns to light tans, and light and dark greens. Textures are medium to coarse for the mountain/hill areas, smooth to fine for the plains and wash areas.

Man-made features become more dominant in urbanized areas and centers such as Flagstaff. There are no known architectural structures of scenic significance.

Refer to Section 3.1.12 for visual resources methodology. No visually classified areas have been identified on either of the two loops of the Base Case on Navajo Reservation lands.

3.6.2 El Paso 600 MMcfd Alternatives

3.6.2.1 Air Quality

Along the alternative routes of the El Paso pipeline there are two nearby PSD Class I areas (Mesa Verde National Park in ~~La Plata~~ Montezuma County, Colorado, and the Petrified Forest National Park in eastern Arizona) which are about 150 miles apart.

A summary of relevant air quality data gathered from monitoring stations near the project area in southwestern Colorado and northwestern New Mexico is shown in Table 3.6-12. Data regarding ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide at the Durango, Cortez, and Pagosa Springs stations are not available. Only the Albuquerque station at Montgomery and San Mateo Streets measured these pollutants in 1982-1983; these pollutants were monitored in 1984 on the Navajo Reservation but not at other New Mexico stations. Arizona air quality data are shown in Table 3.1-2.

3.6.2.2 Geology

Table 3.6-13 summarizes the geologic and physiographic conditions that occur along the El Paso 600 MMcfd Alternatives.

Blanco Loop. This segment of the expansion would lie within the Colorado Plateau. The route is underlain by Quaternary and Tertiary alluvium and sedimentary rocks. Abundant oil and gas reserves as well as coal deposits [New Mexico Bureau of Mines and Mineral Resources, 1965] occur along the route of the expansion

Table 3.6-12

SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO AND NEW MEXICO

		TSP (ug/m^3)		CO (mg/m^3)		NO_2 (ug/m^3)		SO_2 (ug/m^3)			
Station	Year	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr	Max 24-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean
COLORADO											
Durango	1982	136	53	–	–	–	–	–	–	–	–
	1983	182	60	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–
Cortez	1982	82	35	–	–	–	–	–	–	–	–
	1983	–	–	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–
Pagosa Springs	1982	376	120	–	–	–	–	–	–	–	–
	1983	268	10	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–
NEW MEXICO											
Gallup	1982	450	104	–	–	–	–	–	–	–	–
	1983	357	98	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–
Bluewater	1982	192	59	–	–	–	–	–	–	–	–
	1983	–	–	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–
Kerr McGee	1982	278	43	–	–	–	–	–	–	–	–
	1983	297	28	–	–	–	–	–	–	–	–
	1984	86	20	–	–	–	–	–	–	–	–
United Nuclear	1982	170	45	–	–	–	–	–	–	–	–
	1983	–	–	–	–	–	–	–	–	–	–
	1984	–	–	–	–	–	–	–	–	–	–

Table 3.6-12 (continued)
SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO AND NEW MEXICO

Station	Year	TSP ($\mu g/m^3$)		CO (mg/m^3)		NO_2 ($\mu g/m^3$)		SO_2 ($\mu g/m^3$)			
		Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr	Max 24-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean
Milan	1982	315	93	-	-	-	-	-	-	-	-
	1983	316	102	-	-	-	-	-	-	-	-
	1984	292	101	-	-	-	-	-	-	-	-
San Mateo	1982	71	34	-	-	-	-	-	-	-	-
	1983	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-
Paguate	1982	257	35	-	-	-	-	-	-	-	-
	1983	160	40	-	-	-	-	-	-	-	-
	1984	137	36	-	-	-	-	-	-	-	-
Aztec	1982	144	51	-	-	-	-	-	-	-	-
	1983	140	45	-	-	-	-	-	-	-	-
	1984	116	43	-	-	-	-	-	-	-	-
NMSU Exp. Sta.	1982	259	36	-	-	-	-	-	-	-	-
	1983	140	30	-	-	-	-	-	-	-	-
	1984	150	36	-	-	-	-	-	-	-	-
EPNG Plant	1982	114	45	-	-	-	-	-	-	-	-
	1983	119	48	-	-	-	-	-	-	-	-
	1984	136	57	-	-	-	-	-	-	-	-
Farmington	1982	182	78	23	8	-	-	-	-	-	-
	1983	231	67	12	6	-	-	-	-	-	-
	1984	157	67	10	5	-	-	-	-	-	-
Reservation NM/AZ	1982	98	40	-	-	-	-	-	524	105	-
	1983	76	30	-	-	-	-	-	707	105	-
	1984	99	41	-	-	263	0	-	524	131	-

Table 3.6-13

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, EL PASO 600 MMcfd ALTERNATIVES

Location of Alternative Loops	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Blanco (MP 14.6-0.0)	Colorado Plateau	Alluvium, sedimentary rock	Quaternary Tertiary	Rugged, hilly to rolling terrain, becomes more gentle from north to south.	Unconsolidated gravels and sands; well consolidated sedimentary rocks.
Window Rock B (MP 85.3-117.0)	Colorado Plateau	Sedimentary rock	Tertiary, Cretaceous, Permian	Rolling to hilly terrain with several ephemeral washes	Well consolidated sandstones and shales
Window Rock A (MP 118.7-124.5)	Colorado Plateau	Sedimentary rock	Tertiary, Cretaceous, Permian	Rolling to hilly terrain with several ephemeral washes	Well consolidated sandstones and shales
Navajo A (MP 156.5-165.5)	Colorado Plateau	Sedimentary and volcanic rocks	Tertiary, Jurassic to Triassic	Rugged to rolling terrain with several ephemeral washes	Mafic volcanic rocks and associated diatremes intersperse the area
Navajo B (MP 152.4-193.1)	Colorado Plateau	Sedimentary and volcanic rocks	Tertiary, Jurassic to Triassic	Rugged to rolling terrain with several ephemeral washes	Mafic volcanic rocks and associated diatremes intersperse the area
Leupp (MP 229.6-250.3)	Colorado Plateau	Alluvium, sedimentary rock. Dune sands, some volcanic rock	Quaternary, Tertiary, Jurassic to Triassic	Low to moderate relief, drainage areas, small steep buttes	Locally active wind-blown sands and small dunes. Unconsolidated alluvial deposits, hard basalt flows.

Table 3.6-13 (continued)

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, EL PASO 600 MMcfd ALTERNATIVES

Location of Alternative Loops	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Williams A (MP 263.6-276.9)	Colorado Plateau	Sedimentary and volcanic rocks	Quaternary, Tertiary	Rolling to hilly terrain	Rhyolite and basalt flows
Williams B (MP 283.4-299.8)	Colorado Plateau	Sedimentary and volcanic rocks	Quaternary, Tertiary	Rolling to hilly terrain	Rhyolite and basalt flows
Seligman (MP 317.6-347.6)	Colorado Plateau	Volcanic rock	Quaternary	Level plain	Rhyolite and basalt flows
Hackberry (MP 415.9-441.9)	Basin and Range	Sedimentary and alluvial fans	Quaternary to Tertiary	Low to moderate relief	Unconsolidated to poorly or moderately well consolidated deposits
Laguna (100/500) (MP 330.1-332.0, 333.8-334.5, & 337.5-337.8)	Colorado Plateau	Alluvium, sedimentary rock, some volcanic rock	Quaternary, Mesozoic	Low relief in drainage areas. High relief near mesas.	Unconsoldated surficial deposits; includes landslides or rock fall from mesas.
Chaco (200/400) (MP 12.8-19.3)	Colorado Plateau	Sedimentary rock	Tertiary to Cretaceaus	Ephemeral washes, bordered by eroded badlands	Well consolidated sandstones and shales
White Rock (200/400) (MP 43.6-49.0)	Colorado Plateau	Sedimentary rock	Cretaceous	Eroded, barren land dissected by numerous, small ephemeral washes	Well consolidated sandstones and shales
Gallup (200/400) (MP 65.1-70.3)	Colorado Plateau	Sedimentary rock	Tertiary to Cretaceous	Rolling terrain & broad flats with several ephemeral washes	Well consolidated sandstones and shale

in the area atop the San Juan Basin. Some uranium deposits also exist in the area near Aztec, New Mexico.

Window Rock B and A Loops. See Window Rock A, Section 3.6.1.2.

Navajo A Loop. See Navajo A Loop, Section 3.6.1.2.

Navajo B Loop. This segment would be located within the Colorado Plateau. The route traverses a canyon region of moderate relief and a low relief drainage area. The geology is predominantly sedimentary rocks and alluvial deposits. The only unique geologic feature that occurs along the route are the Hopi Buttes (MP 170) and the Painted Desert (MP 195).

Leupp Loop. This segment would lie within the Colorado Plateau. The route traverses low relief drainage areas and the southern perimeter of Elden Mountain. The geology is pre-dominantly basalt flows and cinder ash from Sunset Crater. The loop does not cross any known Quaternary faults [Menges and Pear-three, 1983], but a fault does exist five miles to the southwest. ~~recorded around Flagstaff, Arizona [DuBois et al. 1982].~~ A MM VIII event occurred in 1906 about 1-2 miles northeast of Elden Mountain.

Williams A and B Loops. This segment of the route would lie within the Colorado Plateau. The route is underlain by Jurassic and Triassic sedimentary rocks, along with Tertiary volcanic rock. The area is of moderate seismicity with several earthquake epicenters having been recorded around Flagstaff, Arizona [DuBois et al. 1982]. A MM VIII event occurred in 1906 about one to two miles northeast of Elden Mountain.

Seligman Loop. This segment of the expansion would begin within the Colorado Plateau and would enter the Basin and Range in west-central Arizona. The route is underlain by Quaternary and Tertiary volcanic rock in the Colorado Plateau and by basins of alluvial deposits and mountains of sedimentary and igneous rocks in the Basin and Range region. The loop crosses a preQuaternary fault near MP 321. Yavapai and Mohave Counties, Arizona, recorded a total of 24 earthquake epicenters between 1870 and 1971 [DuBois et al., 1982].

Hackberry Loop. This segment of the expansion would lie within the Basin and Range region of western Arizona. The topography ~~varies from~~ consists of low relief drainages ~~high~~ ranging to moderate relief with ~~steep~~ moderate slopes in and near the southeast end of the Black Mountains. The geology consists of alluvial fan deposits accompanied by rhyolite and andesite flows forming the mountainous regions. The area along the route of the loop is characterized by low seismicity, although nine earthquake epicenters were recorded between 1891 and 1971 [DuBois et al., 1982]. The loop would not cross any known Quaternary faults.

No slope stability problems were observed during the aerial reconnaissance and no subsidence is known to have occurred within the area.

Laguna Loop (100/500 only). This loop, consisting of three segments, would occur totally within the Colorado Plateau Physiographic Province in New Mexico. The route is underlain by Quaternary and Mesozoic alluvium, sedimentary rock, and some areas of volcanic rock. The topography of the route ranges from low relief in drainage areas and on mesa tops to high relief on mesa sideslopes. Olsen [1979] reports several earthquakes in the areas of the Laguna Loop between 1973 and 1978, the largest being of magnitude 4 approximately 10 miles north of Grants. Kittell, et al. [1967] indicate several faults could be crossed by the Laguna Loop. However, no known Holocene movement has occurred.

Chaco Loop (200/400 only). This segment of the expansion would lie within the Colorado Plateau. The route is underlain by Tertiary to Cretaceous sedimentary rocks. Mineral and petroleum resources along the route include oil and gas fields and coal mines [New Mexico Bureau of Mines and Mineral Resources, 1965].

White Rock Loop (200/400 only). This segment of the expansion would lie within the Colorado Plateau. The route would be underlain by Cretaceous sedimentary rocks. Coal deposits area known to occur in the area of the loop [New Mexico Bureau of Mines and Mineral Resources, 1965].

Gallup Loop (200/400 only). This segment of the expansion would lie within the Colorado Plateau. The route is underlain by Tertiary to Cretaceous sedimentary rocks. Mineral resources include coal deposits in the San Juan Basin and uranium deposits east of Gallup, New Mexico [New Mexico Bureau of Mines and Mineral Resources, 1965].

3.6.2.3 Soil

The introductory comments made in Section 3.6.13 apply to this alternative. The alternative would traverse soils within both the Colorado plateau and the Mojave Desert regions. See Section 3.6.1.3 for a description of general soil characteristics within the Colorado Plateau region. See Section 3.1.3.1 for a description of general soil characteristics within the Mojave Desert region.

Blanco Loop. This loop would lie within the Colorado Plateau and would traverse predominantly shallow soils on sloping to steep hills and breaks. A few deep soils occur in small valleys. Water erosion potential ranges from low to high but mostly low, with the high susceptibility occurring on steeper slope breaks. Wind erosion potential is moderate to high, but mostly moderate. Reclamation potential is mostly poor due to low precipitation levels, with good potential only occurring in small valleys.

Soil depth and sandy texture are the primary limiting factors [SCS, 1980b].

Window Rock B Loop. This loop would lie within the Colorado Plateau and would traverse very deep to shallow soils and rockland on rough broken topography, valleys, and mountain plateaus. Water erosion potential ranges from low to high, with the high potential being on steeper slopes. Wind erosion potential is mostly moderate. Reclamation potential is evenly distributed from good to poor. Soil depth, slope, and clayey texture are the primary limiting factors [SCS, 1981c].

Window Rock A Loop. See Section 3.6.1.3 for a description of the soils along this loop.

Navajo B Loop. This loop would lie within the Colorado Plateau and would traverse shallow soils on the edges of cinder cones or slope breaks would be crossed. Water erosion potential is mostly low, and wind erosion potential is low to moderate. Reclamation potential ranges from good to poor, but is mostly poor. Soil depth, clayey and sandy texture, and rock fragments are the primary limiting factors [SCS, 1981c].

Navajo A Loop. See Section 3.6.1.3 for a description of the soils along this loop.

Leupp Loop. The Leupp Loop would cross the Colorado Plateau region and would traverse very deep to shallow soils on plains, plateaus, mesas, sideslopes, and alluvial deposits. Water and wind erosion potentials are mostly low to moderate. Reclamation potential is mostly fair to poor. Shallow depth and rock fragments are the primary limiting factors [SCS, 1983a; Robertson, 1986].

Williams A Loop. This loop would lie within the Colorado Plateau region and would predominantly traverse deep and moderately deep soils on high-elevation plateaus. Water and wind erosion potentials are low to moderate, but mostly low. Reclamation potential is fair to poor. Soil depth, rock fragments, and clayey texture are the primary limiting factors [Robertson, 1986; Jorgensen, 1986].

Williams B Loop. This loop would lie within the Colorado Plateau region and would traverse intermingled shallow to deep soils on plateaus, plains, mesas, and sideslopes. Water and wind erosion potential ranges from low to moderate but is mostly low, with a smaller amount having high potential on segments which cross steeper slopes. Reclamation potential is fair to poor but mostly poor. Clayey texture, rock fragments, and soil depth are the primary limiting factors [Jorgensen, 1986; SCS, 1976c].

Seligman Loop. This loop would lie within the Colorado Plateau region and would traverse intermingled very shallow to deep soils on plains, mesas and moderately steep sideslopes. Water erosion potential ranges from low to moderate but is mostly low, with a lesser amount of high potential on steeper sideslopes. Wind erosion potential is low. Reclamation potential is fair to poor but mostly poor, due to shallow depth, clayey texture, and rock fragments [SCS, 1976b].

Hackberry Loop. The Hackberry Loop would cross the Mojave Desert region and would traverse deep soils and shallow soils over hardpans on alluvial fans and terraces. Water erosion potential is mostly low, and wind erosion potential is mostly moderate to high but mostly moderate. Reclamation potential ranges from good to poor, but mostly poor. Soil depth, sandy texture, and gravels are the primary limiting factors [BLM, 1979].

Laguna Loop (100/500 only). The Laguna Loop would traverse mostly deep alluvial soils on sloping and undulating landscapes. Water erosion potential is mostly low and wind erosion potential is low to moderate. Reclamation potential ranges from good to poor, with sandy and clayey textures being the primary limiting factors [~~SCS, 1975b~~ BLM, 1972, Maker, et al., 1978].

Chaco Loop (100/500 only). This loop would lie within the Colorado Plateau region and would traverse predominantly deep soils on mesas, plateaus and bottomlands. A very short segment crosses badlands. Topography is nearly level to sloping, and only becomes steep on short breaks. Water erosion potential is low and wind erosion potential is moderate to high. Reclamation potential ranges from good to poor but mostly poor. Sandy texture, salinity and alkalinity are the primary limiting factors [SCS, 1980b].

White Rock Loop (100/500 only). This segment of the expansion would lie within the Colorado Plateau region and would predominantly traverse badland and rockland, with intermingled areas of deep soils. Topography is gently sloping to steep on the eroded landscape. Water and wind erosion potentials range from low to high but are mostly low. Reclamation potential ranges from good to poor, but is mostly poor. Lack of soil, sandy texture, salinity and alkalinity are the primary limiting factors [BIA, 1972].

Gallup Loop (200/400 only). This loop would lie within the Colorado Plateau region and would traverse predominantly deep and moderately deep soils and only a small amount of shallow soils. Topography is mostly gently sloping. Water erosion potential is mostly low, and wind erosion potential is primarily moderate. Reclamation potential is mostly fair to good. Clayey texture and soil depth are the primary limiting factors [Maker et al, 1978].

3.6.2.4 Surface Water

The general description of flow characteristics of streams presented in Section 3.6.1.4 apply to this case. The loops of the 600 MMcfd Alternatives would traverse five major USGS-designated drainage basins including the San Juan River, Rio Grande, Little Colorado River, Gila River, and Colorado River basins. Table 3.6-2 lists the drainage channels that would be crossed by the project loops.

Blanco, Gallup (200/400 only), Window Rock A, Navajo A and B, Seligman, Leupp, Williams A and B, Hackberry and Laguna Loops (100/500 only). No significant water resources occur along the routes of these loops.

Chaco Loop (200/400 only). Gallegos Canyon, a major intermittent stream, would be traversed by this loop. Flows in this drainage were gauged from October 1977 to September 1981 at USGS Station 09357250 near Farmington, New Mexico. The maximum flow recorded occurred on January 17, 1979 with a peak discharge of 900 cfs. However, no flow occurs most of the time.

White Rock Loop (200/400 only). The Chaco River, ~~a major~~ an intermittent ~~to perennial~~ stream, would be traversed by this loop. Flows in this river were gauged at USGS Station 09367683 from March 1980 to September 1981 at the Pueblo Bonito Bridge in Chaco Canyon National Monument and included a maximum flow of ~~1,260~~ 428 cfs on ~~January 18, 1979~~ August 24, 1982 [USGS 1983, Water Resources Data New Mexico Water Year 1983. USGS Water-Data Report NM-83-1, 525 pp]. However, no surface flow occurs most of the time.

Window Rock B Loop. Major drainage channels that this loop would traverse include Defiance Draw, Black Creek, and Cienega Creek. With the exception of Black Creek, which is marginally perennial to intermittent, these streams are primarily intermittent. Black Creek, which is marginally intermittent, was gauged from August 1964 to September 1981 at USGS Station 09395900 near Lupton, Arizona. The average flow gauged was 7.75 cfs and a maximum flow of 7,160 cfs on August 17, 1977. No flow occurs for many days during each year.

3.6.2.5 Groundwater

Specific groundwater conditions are summarized in Table 3.6-14. In addition to the major aquifers that would be traversed by the proposed expansion, localized areas of saturated alluvial valley fill associated with intermittent and perennial streams may be traversed by the various loops. See Section 3.6.1.4 for a discussion on streams that would be crossed and their location along the route of the loops.

Blanco and White Rock (200/400 only) Loops. Groundwater occurs beneath the Blanco Loop in interbedded sandstone and mudstone. The depth to groundwater in the area is generally greater than 200 feet and the water is slightly saline. These factors,

Table 3.6-14

GROUNDWATER OCCURRENCE, EL PASO 600 MMcfd ALTERNATIVES

Alternative Loop	Minimum Depth to Water (ft)	Total Dissolved Solids Concentration (mg/l)	Degree of Groundwater Development	References	Comments
Blanco	>200	1500-3500	low	Stone et al [1983] Price and Arnow [1974]	No major springs
Window Rock B & A	200-500	< 1000	low	Davidson [1979]	No major springs
Navajo A & B	> 500	> 3000	low	Davidson [1979]	No major springs
Leupp	> 500	> 3000	low	Davidson [1979]	No major springs
Williams A & B	> 500	< 1000	moderate	Davidson [1979] Bedinger et al [1984] Langer et al [1984] Thompson et al [1984]	No major springs
Seligman	> 500	< 500	low	Bedinger et al [1984] Langer et al [1984] Thompson et al [1984]	No major springs
Hackberry	> 500	< 500	low	Bedinger et al [1984] Langer et al [1984] Thompson et al [1984]	No major springs
Laguna (100/500 only)	40-100	>2000	low	Dinwiddie & Motts [1984]	No major springs
Chaco (200/400 only)	100	<1000	low	Stone et al [1983]	No major springs
White Rock (200/400 only)	> 100	1500-2500	low	Stone et al [1983] Price and Arnow [1974]	No major springs
Gallup (200/400 only)	200-500	1000-2000	low	Stone et al [1983] Davidson [1979]	No major springs

together with well yields that normally are less than 50 gallons per minute [Price and Arnow, 1974], have resulted in only limited development of groundwater resources in the vicinity of the loop.

Window Rock B and A Loops. Groundwater occurrence beneath these loops is similar to that presented for the Window Rock A Loop in Section 3.6.1.5.

Navajo A and B, and Leupp Loops. Groundwater occurrence beneath these loops is similar to that presented for the Navajo A Loop in Section 3.6.1.5.

Williams A Loop. Groundwater beneath the Williams A Loop occurs under conditions similar to those beneath the White Rock Loop. The depth to groundwater is typically greater than 500 feet in the area, and the water is fresh. Moderate groundwater development has occurred immediately east of this loop in the vicinity of Flagstaff.

Williams B, Seligman, and Hackberry Loops. Groundwater occurrence beneath these loops is similar to that presented for the Williams A Loop. Groundwater usage is lower due to the remoteness of the area.

Laguna Loop (100/500 only). The groundwater that occurs beneath the Laguna Loop is in sandstone units. Limited data indicate that the depth to water beneath the loop is 40 to 100 feet. Wells in the vicinity typically yield less than 10 gallons per minute. These low yields, in addition to the poor water quality, has resulted in only limited groundwater development in the region.

Chaco Loop (200/400 only). In the vicinity of the Chaco Loop, groundwater occurs in formations consisting of interbedded sedimentary formations. The groundwater that exists at a depth of about 100 feet beneath the loop is considered fresh. However, due to the remoteness of the site, groundwater development in the area is limited.

Gallup Loop (200/400 only). The occurrence of groundwater beneath the Gallup Loop is similar to that discussed for the Blanco Loop. Although moderate groundwater development has occurred in the region surrounding the loop (primarily in the area of Gallup), the uppermost saturated zone beneath the loop has only been developed to a limited extent.

3.6.2.6 Freshwater Biology

Except as noted below, no perennial streams are crossed and no potential exists for encountering a species of special concern. Some ephemeral aquatic habitats may exist but organisms utilizing these would be restricted to certain specialized algae, crustaceans, insects or other taxa with short opportunistic life cycles or adaptations for withstanding extended drought periods. Aquatic communities, when present, are typically inhibited by high suspended sediment concentrations, rapidly fluctuating flows, periodic drought, undesirable algal growths and elevated stream temperatures.

Window Rock B Loop. Black Creek, a marginally perennial stream, may support a limited population of nongame fish, but does not contain any game species in the vicinity of the crossing [Diswood, 1986].

White Rock Loop. This loop would traverse one major intermittent stream, the Chaco River. No significant perennial aquatic habitats exist in the vicinity of the crossing.

3.6.2.7 Terrestrial Biology

3.6.2.7.1 Vegetation

Refer to Section 3.6.1.7.1 of the Base Case alternative for a discussion on information used to describe and map vegetation along the loops.

The El Paso 600 MMcfd Expansion Alternatives would traverse the Colorado Plateau and Mojave Desert geographic regions. Within the Colorado Plateau, five basic vegetation types would occur along the expansion: ponderosa pine woodland, pinyon-juniper woodland, plains grassland, sagebrush scrub, and agricultural land. Mojavean creosote bush scrub is the only vegetation type that would be traversed in the Mojave Desert region. Narrow zones of riparian vegetation may occur within these vegetation types along streams. These zones are numerous and impractical to resolve at this level of analysis. The distribution of the various community types along the loop routes is provided in Table 3.6-15.

Several rare plants occur in the area traversed by the loops. These rare plants include federally listed and candidate species for listing. Appendix C lists the plant species of concern, their status and associated habitats, and the ~~mileposts at which they occur along the proposed routes~~ loop on which they have been identified. Table 3.6-16 lists plant species of concern that are legally protected due to their threatened or endangered status at the state or federal level.

Table 3.6-15

VEGETATION COMMUNITY TYPES, EL PASO 600 MMcfd EXPANSION ALTERNATIVES

Loop	Geographic Region	Community Type	Milepost
Blanco	Colorado Plateau	Pinyon-juniper woodland	14.6-6.1
		Sagebrush scrub	6.1-0.0
Window Rock B		Pinyon-juniper woodland	85.3-96.1
		Plains grassland	96.1-101.1
		Pinyon-juniper woodland	101.1-106.1
		Ponderosa pine woodland	106.1-117.0
Window Rock A		Pinyon-juniper woodland	118.7-124.5
Navajo B		Plains grassland	152.4-160.5
		Pinyon-juniper woodland	160.5-166.8
		Plains grassland	166.8-178.0
		Sagebrush scrub	178.0-188.0
		Plains grassland	188.0-193.1
Navajo A		Plains grassland	156.5-160.5
		Pinyon-juniper woodland	160.5-165.5
Leupp		Plains grassland	229.6-230.5
		Pinyon-juniper woodland	230.5-232.5
		Ponderosa pine woodland	232.5-250.3
Williams A	Colorado Plateau	Ponderosa pine woodland	263.6-265.0
		Plains grassland	265.0-269.5
		Ponderosa pine woodland	269.5-275.0
		Plains grassland	275.0-276.9
Williams B		Plains grassland	283.4-284.0
		Ponderosa pine woodland	284.0-291.5
		Pinyon-juniper woodland	291.5-298.5
		Plains grassland	298.5-299.8
Seligman		Plains grassland	317.6-333.5
		Pinyon-juniper woodland	333.5-341.5
		Plains grassland	341.5-347.6
Hackberry	Mojave Desert	Mojavean creosote bush scrub	415.9-441.9

Table 3.6-15 (continued)

VEGETATION COMMUNITY TYPES,
EL PASO 600 MMcfd EXPANSION ALTERNATIVES

Loop	Geographic Region	Community Type	Milepost
Laguna (100/500 Case only)	Colorado Plateau	ROW vegetation [1]	330.1-332.0
		ROW vegetation	333.8-334.5
		ROW vegetation	337.5-337.8
Chaco (200/400 Case only)		Sagebrush scrub	12.8-14.8
		Agricultural land	14.8-19.3
White Rock (200/400 Case only)		Sagebrush scrub	43.6-49.0
Gallup (200/400 Case only)		Sagebrush scrub	65.1-70.3

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[1] See text, Laguna-Loops.

Table 3.6-16

LEGALLY PROTECTED PLANT SPECIES,
EL PASO 600 MMcfd EXPANSION ALTERNATIVES [1]

Species	Status [2]	Loop(s)
Knowlton cactus	LE	Blanco
Mancos milkvetch	LE	Blanco, Chaco, White Rock
Mesa Verde cactus	LT	White Rock
Peebles Navajo cactus	LE	Navajo A and B, Window Rock A
Arizona Cliffrose	LE	Seligman, Hackberry
Zuni (Rhizome) Fleabane	LT	Laguna

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[1] Species of concern include those species having the highest probability of occurring along the pipeline based on existing information

[2] LE - federally listed endangered; LT - federally listed threatened

Blanco Loop. This loop expansion would traverse the Colorado Plateau region. The two vegetation types that would be traversed by the loop are pinyon-juniper woodland and sagebrush scrub. Two federally listed plant species, Knowlton cactus and Mancos milkvetch, and one federal candidate species may occur in areas traversed by the loop. The Knowlton cactus grows in dry gravelly soil within the pinyon-juniper woodland community type on Tertiary alluvial deposits overlying the San Jose Formation. Mancos milkvetch grows on broken sandstone slopes of the Mesa-Verde or Pictured Cliffs Formations in the sagebrush scrub and pinyon-juniper woodland types.

Window Rock B Loop. This loop would be located in the Colorado Plateau region. Three vegetation types to be traversed by the loop are pinyon-juniper woodland, plains grassland and ponderosa pine woodland. No plant species of special concern are known to occur along this route.

Window Rock A Loop. This loop is the same as described in Section 3.6.1.7.1 of the El Paso Base Case Expansion proposal.

Navajo B Loop. This loop would traverse the Colorado Plateau region. Three vegetation types to be traversed by the proposed loop are plains grassland, pinyon-juniper woodland and sagebrush scrub. Peebles Navajo cactus, a federally listed species, and one federal candidate species may occur in areas traversed by this loop. The habitat exploited by Peebles Navajo cactus was described in Section 3.6.1.7.1.

Navajo A Loop. This loop is the same as described in Section 3.6.1.7.1 of the El Paso Base Case Expansion proposal. Peebles Navajo cactus, a federally listed species, and one federal candidate species may occur in areas traversed by the loop. The habitat exploited by Peebles Navajo cactus was previously described in Section 3.6.1.7.1.

Leupp Loop. This loop would traverse the Colorado Plateau region. Three vegetation types, including plains grassland, pinyon-juniper woodland and ponderosa pine woodland, would be traversed by the loop. The ponderosa pine type from MP 247.0-250.0 supports an understory of cliffrose and mountain mahogany. Five federal candidate species may occur in areas that would be traversed by the loop.

Williams A Loop. This loop traverse two community types in the Colorado Plateau region, plains grassland and ponderosa pine woodland. Five federal candidate species may occur in areas that would be traversed by the loop.

Williams B Loop. This loop would traverse the Colorado Plateau region. Three community types, plains grassland, pinyon-juniper woodland, and ponderosa pine woodland, would occur along the loop. The pinyon-juniper type from MP 283.4-293.5 supports an understory of cliffrose, skunk bush, mountain mahogany, turbinella oak, Apache plume, and currant. Four federal candidate species may occur in areas that would be traversed by the loop.

Seligman Loop. This loop would traverse two community types in the Colorado Plateau region, plains grassland and pinyon-juniper woodland. Arizona cliffrose, a federally listed species, may occur in areas that would be traversed by the loop. The species grows in calcareous soils on low rolling arid hills within the Mojavean creosote bush scrub community type.

Hackberry Loop. This loop would traverse the Mojavean creosote bush scrub community in the Mojave Desert geographic region. Arizona cliffrose, a federally listed species, may occur in areas that would be traversed by the loop. The habitat of the species was described under the Seligman Loop.

Laguna Loop (100/500 only). This loop would involve denuding only vegetation from the pre-existing pipeline right-of-way. Vegetation on the pre-existing ROW has not returned to a completely natural state since construction of the existing Permian/San Juan pipeline, in the 1950s but instead includes a mixture of native species from the surrounding plains grassland and pinyon-juniper communities as well as species used for soil stabilization along the ROW. Zuni (Rhizome) fleabane, a federally listed species, may occur in areas traversed by the loop. The species grows on highly erodible sandstone slopes of the Chinle Shale within the pinyon-juniper community type.

Chaco Loop (200/400 only). This loop would traverse the Colorado Plateau region. Two community types to be traversed by this loop are sagebrush scrub and agricultural land associated with the Navajo Indian Irrigation Project. Mancos milkvetch, a federally listed species, may occur in areas that would be traversed by the loop. The species grows on broken sandstone slopes of the Mesa-Verde or Pictured Cliffs Formations within the sagebrush scrub community type.

White Rock Loop (200/400 only). This loop would traverse the sagebrush scrub community within the Colorado Plateau geographic region. Mesa Verde cactus and Mancos milkvetch, federally listed species, may occur in areas that would be traversed by the loop. Mesa Verde cactus grows within harsh sites on badland hills derived from Mancos Shale and Fruitland Formations within the sagebrush scrub community type.

Gallup Loop (200/400 only). This loop would traverse the sagebrush scrub community within the Colorado Plateau region. No plant species of special concern are known to occur in the general vicinity of the loop.

3.6.2.7.2 Wildlife

The introductory description of the wildlife resources, scope of analysis and sources of information presented in Section 3.6.1.7.2 for the El Paso Base Case is applicable to the following discussion of the El Paso 600 Proposal.

Many locally important wildlife features such as water tanks, springs, and riparian areas occur along the pipeline route in the Colorado Plateau region, primarily in the Coconino and Kaibab National Forests (Table 3.6-17; Map 3, Volume IV). These features provide unique habitat for food, cover, water, and migration corridors for a variety of wildlife species, including elk, mule deer, wild turkeys, and nongame birds and mammals. Several areas traversed by the pipeline would pass through specific habitats, such as old growth forest, that are designated as wildlife deferral areas, as per agreements between the Forest Service and the Arizona Fish and Game Department [Dickens, 1986]. All wildlife features are discussed in this section except for the limited riparian habitat, which is described under the Vegetation Section (3.6.2.7.1).

Presence and distribution of wildlife species, features and habitats are based on published literature, data files of federal and state agencies, and personnel familiar with the areas of concern.

Wildlife species that are listed by the U.S. Fish and Wildlife Service as threatened or endangered, and candidates for such listing are discussed for each loop where appropriate. Table 3.6-5 lists species of special concern, their status and loops on which they potentially occur.

Blanco Loop. Wildlife occurring along the Blanco Loop expansion are characteristic of Great Basin desert scrub and pinyon-juniper woodlands.

Common wildlife occurring in the Great Basin desert scrub community includes the sagebrush lizard, western whiptail, striped whipsnake, western yellowbelly racer, sage thrasher, Brewer's sparrow, sage sparrow, horned lark, ~~sage grouse,~~ pallid bat, Great Basin pocket mouse, Ord's kangaroo rat, Townsend's ground squirrel, least chipmunk, desert cottontail, black-tailed jackrabbit, badger, kit fox, bobcat and mule deer.

Pinyon-juniper woodland vegetation supports many of the species found in the Great Basin desert shrub in addition to providing habitat for species such as the tree lizard, sagebrush lizard, pinyon jay, great horned owl, Cooper's hawk, sharp-shinned hawk, ladderback woodpecker, common flicker, common nighthawk, Clark's nutcracker, gray flycatcher, green-tailed towhee, big brown bat, pinyon mouse, deer mouse, and mule deer.

Table 3.6-17
IMPORTANT WILDLIFE HABITAT FEATURES, EL PASO 600 MMcfd ALTERNATIVES

Loop	Milepost	Wildlife Concerns	Applicable Line [1]
Leupp	231.6	Guzzler	1/5, 2/4
	236.8	Guzzler	1/5, 2/4
	247.0-250.0	Critical winter range for deer	1/5, 2/4
	248.3	Spring	1/5, 2/4
Williams A	264.4	Water tank	1/5, 2/4
	264.6	Water tank	1/5, 2/4
	264.8	Water tank	1/5, 2/4
	264.0-265.0	Timber deferment area	1/5, 2/4
	265.5-266.5	Elk Meadow	1/5, 2/4
	266.5-270.5	High value elk and pronghorn habitat	1/5, 2/4
	268.5	Water tank	1/5, 2/4
	270.0	Water tank and spring	1/5, 2/4
	270.4	Water tank	1/5, 2/4
	270.7	Water tank	1/5, 2/4
	272.2	Spring	1/5, 2/4
	273.4	Water tank	1/5, 2/4
	274.0	Water tank	1/5, 2/4
	275.0	Spring	1/5, 2/4
Williams B	286.5-288.5	Turkey roosting area	1/5, 2/4
	283.4-295.0	High value elk/mule deer winter habitat	1/5, 2/4
	284.3	Water tanks (2)	1/5, 2/4
	286.4	Water tank	1/5, 2/4
	286.6	Water tank	1/5, 2/4
	288.9	Water tank	1/5, 2/4
	289.4	Water tank	1/5, 2/4
	290.0	Water tank	1/5, 2/4
	292.2	Water tank	1/5, 2/4
	293.0	Water tank	1/5, 2/4
	296.0	Water tank	1/5, 2/4
Seligman	317.6-324.0	High value pronghorn habitat	1/5, 2/4
	317.6-324.0	High value prairie dog habitat	1/5, 2/4
	324.0-330.4	High value mule deer habitat	1/5, 2/4
	330.4-338.6	High value pronghorn habitat	1/5, 2/4
	338.6	High value mule deer habitat	1/5, 2/4

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[1] 1/5 = 100/500 Alternative; 2/4 = 200/400 Alternative.

Three federally listed endangered species potentially occur on the loop. Winter concentration areas for the bald eagle occur along the San Juan and Animas Rivers near the pipeline route and individual birds may occur in the loop area during migration. The peregrine falcon may also occur in the area during migration. Black-footed ferrets historically occurred in the ~~area of the proposed loop, but no verified sightings of the animal have been documented since 1960 [NMDFG, 1984].~~ San Juan Basin, although there are no verified sighting from the area of the loop. The last verified record in New Mexico is from 1934 [Hubbard and Schmitt, 1984]. Ferrets are generally found in association with prairie dogs and may potentially occur along the loop expansion, but at present it is not known if viable prairie dog colonies exist along the proposed alignment.

Federal candidate species that may occur along the loop include the ferruginous and Swainson's hawk. These species are generally ubiquitous in open grassland and shrub communities throughout the western United States, although rarely occurring in the project area. No active nests have been identified within the area of concern.

Window Rock B Loop. Wildlife species occurring on this loop expansion are characteristic of the plains grassland and ponderosa pine woodland community types described below and the pinyon-juniper woodland community type previously described under the Blanco Loop.

Habitat provided by the ponderosa pine woodland supports many of the species listed for the pinyon-juniper woodland community in addition to the goshawk, long-eared owl, Merriam's turkey, hairy woodpecker, pine grosbeak, pine siskin, small-footed myotis, Merriam's shrew, vagrant shrew, red squirrel, Abert's squirrel, long-tailed weasel, and elk.

Plains grassland habitat along the pipeline route occurs both as a mosaic with other community types along the route or as continuous grasslands in valley areas. Where the grasslands occur interspersed with other habitats, wildlife species from adjacent woodlands or desert scrub community types potentially occur within the grassland community. In larger grassland areas common species include the prairie falcon, western meadowlark, plains pocket mouse, Gunnison's prairie dog, and pronghorn antelope.

Federally listed endangered species that potentially occur along the loop are the bald eagle and peregrine falcon. These raptors may be present as migrants or winter visitors. Three candidate species that may occur in this area are the ferruginous hawk, Swainson's hawk, and mountain plover. No nest sites or winter concentration areas have currently been identified for any of these species within the area of concern.

Window Rock A Loop. This loop has been previously described under the Base Case alternative (Section 3.6.1.7.2).

Navajo A Loop. This loop has been previously described under the Base Case alternative (Section 3.6.1.7.2).

Navajo B Loop. Wildlife that occur along the Navajo B Loop expansion are characteristic of the pinyon-juniper woodland and Great Basin desert scrub community types described for the Blanco Loop, and the plains grassland community type described for the Window Rock B Loop.

Leupp Loop. Wildlife species occurring along the Leupp Loop expansion are characteristic of the plains grassland, ponderosa pine woodland, and pinyon-juniper woodland community types previously described.

Two water guzzlers and a spring occur within 0.5 mile of the loop [Goodwin, 1986]. Water guzzlers are important artificial habitat features for many wildlife species in arid environments. They are often the only available free water source in an area, and as such tend to concentrate individuals and species at one locality.

Critical winter range for mule deer exists from MP 247-250.5. High density of deer is squeezed between Mt. Elden and the city of Flagstaff in this area during winter.

Federally listed endangered species that potentially occur along the expansion are the bald eagle and peregrine falcon. Individuals may be present as temporary migrants or winter visitors. Two candidate species, the ferruginous hawk and Swainson's hawk, may also occur. No nests or winter concentration areas have been identified for any species of special concern along the loop.

Williams A Loop. Wildlife species that occur along this loop are characteristic of the plains grassland and ponderosa pine woodland community types previously described.

Williams A Loop. Special habitat features identified ~~along~~ within one-half mile of this alignment are ~~five~~ nine water tanks, ~~one~~ two natural springs, one mile of elk meadow, and approximately one mile of old growth forest (timber deferral area) [Dickens, 1986]. The loop parallels four miles of Government Prairie, a large montane grassland of high value to pronghorn antelope and elk.

Federally listed endangered species that potentially occur along the expansion are the bald eagle and peregrine falcon. Individuals may be present as temporary migrants or winter visitors. Two candidate species, the ferruginous hawk and Swainson's hawk, may also occur. No nests or winter concentration areas have been identified for any species of special concern along the loop.

Williams B Loop. Wildlife species that occur along this loop are characteristic of the plains grassland, pinyon-juniper woodland and ponderosa pine woodland community types. Characteristic wildlife species have been previously described.

The loop would cross two miles of a delineated turkey roosting area [Dickens, 1986]. Ten water tanks are within one-half mile of the loop. From MP 283.4-295.0 the pinyon-juniper woodland supports an understory of important browse species, e.g., cliffrose and mountain mahogany, which support large numbers of elk and mule deer during winter.

Federally listed endangered species that potentially occur along the expansion are the bald eagle and peregrine falcon. Individuals may be present as migrants or winter visitors. Two candidate species, the ferruginous hawk and Swainson's hawk, may also occur. No nests or winter concentration areas have been identified for any species of special concern along the loop.

Seligman Loop. Wildlife species that occur along this loop expansion are characteristic of the plains grassland and pinyon-juniper woodland community types previously described.

The loop crosses approximately 15 miles of high value pronghorn antelope habitat and 15 miles of high value mule deer habitat [Ferrell,1986].

Federally listed endangered species that potentially occur along the loop are the bald eagle, peregrine falcon and black-footed ferret. Bald eagles and peregrines may be present as temporary migrants or winter visitors. No winter concentrations have been identified for these species within the area of concern. The alignment crosses approximately six miles of high value prairie dog habitat. Because of the interrelationship of ferrets and prairie dogs, the potential exists for ferrets within this area. At present it is ~~not~~ known ~~if~~ that viable prairie dog colonies exist along the loop. Federal candidate species include the ferruginous and Swainson's hawks. No nests have been identified for these species along the loop.

Hackberry Loop. Wildlife species that occur along this loop expansion are characteristic of the Mojavean creosote bush scrub and include the desert iguana, zebratail lizard, western whiptail, desert horned lizard, brush lizard, coachwhip snake, western patchnose snake, gopher snake, sidewinder, red-tailed hawk, Gambel's quail, roadrunner, poorwill, cactus wren, loggerhead shrike, verdin, LeConte's thrasher, horned lark, black-throated sparrow, little pocket mouse, desert kangaroo rat, southern grasshopper mouse, desert woodrat, desert cottontail, black-tailed jackrabbit, coyote and kit fox.

Federally listed endangered species that potentially occur along the Hackberry Loop expansion are the bald eagle and peregrine falcon. Bald eagles and peregrines may occur near the terminus of the loop as migrants and winter visitors, particularly in the vicinity of Topock Marsh on the Colorado River. No roosts or winter concentrations have been identified for these raptors within the area of concern.

Gila monsters may occur along the entire loop, although densities would likely be low [Hall, 1986].

The desert tortoise is listed as a federal candidate and classified by Arizona Game and Fish Department as Group 3. This state listing indicates that concern exists for the species, but not enough biological information is available to take further action. The desert tortoise occurs throughout western Arizona, although populations are patchy and island-like [Schwable, 1986]. They are primarily found in rocky crevices, washes and other broken rocky terrain [Schwable, 1986]. Approximately 40 percent of desert tortoise habitat in Arizona has presently been surveyed, and results indicate that, where found, populations range from 25-400 per square mile [Schwable, 1986]. Tortoise populations within Arizona have been designated by Arizona Game and Fish Department as low (<25 tortoise/mi^2), medium (25-50 tortoise/mi^2), and high (>50 tortoise/mi^2) densities [Schwable, 1986]. Most of the currently surveyed populations within the state fall within the medium density class [Schwable, 1986]. All of this loop crosses potential tortoise habitat; however, no discrete populations have been delineated for the area of concern.

Laguna Loop (100/500 only). Wildlife species that occur along this loop are characteristic of plains grassland, pinyon-juniper woodland, and desert scrub community types previously described.

Federally listed endangered wildlife species which may potentially occur along the loop are the bald eagle, peregrine falcon, and black-footed ferret. Bald eagles and peregrine falcons occur as migrants. Prairie dog colonies potentially occur within the grassland communities along this route, but no viable colonies have been delineated. These colonies provide the habitat necessary for ferrets. Federal candidate species potentially occurring in the area are the ferruginous hawk and Swainson's hawk. No nests have been identified within the area of concern.

Chaco Loop (200/400 only). Wildlife species occurring along the Chaco Loop expansion are characteristic of the Great Basin desert scrub community previously described.

Federally listed endangered species potentially occurring along the Chaco Loop expansion include the bald eagle, peregrine falcon, and black-footed ferret. The bald eagle and peregrine falcon occur mainly as migrants. No nest sites have been delineated in the area of concern. The loop lies within ~~traditional~~ historical black-footed ferret range. Black-footed ferrets are generally found in association with prairie dogs and could occur along the proposed loop expansion where prairie dog colonies exist. At present, no viable prairie dog colonies have been identified for the area of concern. Federal candidate species that may occur along the loop include the ferruginous hawk, Swainson's hawk and mountain plover. No nests have been delineated along the loop.

White Rock Loop (200/400 only). Wildlife species occurring on the White Rock expansion are characteristic of the Great Basin desert scrub community type described above.

Federally listed endangered and candidate species potentially occurring along the White Rock Loop are the same as those described for the Chaco Loop.

Gallup Loop (200/400 only). Wildlife species occurring along the loop are characteristic of the Great Basin desert scrub community type described above.

Federally listed endangered and candidate species potentially occurring along the Gallup Loop are the same as those described for the Chaco Loop.

3.6.2.7.3 Grazing

The El Paso 600 MMcfd alternatives would traverse a variety of grazing allotments and lands with federal, state, and private ownership. Brief descriptions of grazing for each loop follows; Appendix D should be consulted for more details. Where grazing allotments are not delineated and open range exists, AUMs are not accurately documented. Therefore, only an estimate of acres per AUM is given in Appendix D.

Blanco Loop. This loop would intersect five Bureau of Land Management (BLM) allotments located northeast of Bloomfield, New Mexico, which range in size from 2,988 to 32,860 acres and provide permanent range for cattle.

Window Rock A and B and Navajo A and B Loops. These loops would intersect BIA open range. This land provides permanent range for cattle, sheep, and horses often on a year-round basis.

Leupp Loop. Three grazing allotments and BIA open range are intersected by this loop. The allotments, on FS and BIA lands, involve 66,401, 13,753, and 179,000 acres and provide permanent range for cattle. The BIA land is range for cattle, sheep, and horses.

Williams A and B Loops. This loop would intersect seven allotments on land under FS management and range in size from 10,208 to 43,403 acres. They provide permanent range for cattle.

Seligman and Hackberry Loops. These two loops intersect state and private lands which are grazed, but specific information on grazing is not available.

Laguna Loop. No grazing occurs along this loop.

Chaco Loop. This loop would intersect one permanent grazing allotment encompassing 9,597 acres of BIA land. Cattle, sheep, and horses are grazed on this range.

White Rock and Gallup Loops. These loops fall on BIA open range where cattle, sheep, and horses are grazed on a nearly year round basis.

3.6.2.8 Socioeconomics

3.6.2.8.1 Population, Housing, and Economic Characteristics

Both alternatives include loops in San Juan and McKinley ~~and Cibola~~ Counties, New Mexico, as well as five counties in Arizona: Mohave, Apache, Coconino, Navajo, and Yavapai. The 100/500 case would also include Cibola County, New Mexico, for the Laguna Loop. One of the compressor stations is in La Plata County in Colorado.

Arizona Counties. Mohave County will be affected by the El Paso project. It was profiled in Section 3.1.8.1.

Apache, Coconino, Navajo, and Yavapai counties are all traversed by either the Transwestern (see Section 3.7.8.1) or El Paso pipelines. The ~~combined~~ 1980 ~~and--1984~~ population of these counties was 262,890; the 1984 population of these four counties was 286,400. ~~respectively.~~ These four counties all have sufficient infrastructure to provide goods and services to either pipeline construction workers or the pipeline companies. On average, 55.1 percent of the population in these counties is of working age (18 to 64).

The four counties had a combined employment of 99,655 in December 1985. The unemployment rates in these counties ranged from 6.9 percent to 18.4 percent in that month. Employment in these counties is primarily concentrated in the trade and services industries. Per capita personal income ranged between $5,740 and $9,868 in these counties. Public services are fairly well established and in good supply in these counties due to the presence of a reasonable amount of population for the geographic region. For example, a hospital exists within each county. Employment data are shown in Table 3.1-14.

There were 605 establishments providing 42,486 guest rooms in Arizona [Bureau of the Census, 1982 Census of Service Industries]. There are, however, very few temporary accommodations in the four counties along the El Paso routes. The average daily room rates in Arizona, exclusive of the major cities, was $46.27 in 1985 with occupancy rates of around 41 percent [Pannell, Kerr, Forster, 1985]. If construction workers were to seek hotels or motels, the logical locations are Winslow where 547 rooms exist, Flagstaff where 2,655 rooms exist and Holbrook where 748 rooms exist. Housing data are provided in Table 3.1-13.

Table 3.1-15 presents profiles of Holbrook, Flagstaff, and Winslow. The towns' populations are between 7,921 and 34,743 and vacancy rates in permanent housing average 9.4 percent.

Colorado County. La Plata County, in the southwest corner of Colorado, may be affected by the El Paso expansion where additional compression may be added to the existing Bondad Compressor Station. La Plata County is profiled in Tables 3.1-13 and 3.1-14. Durango is the nearest town in La Plata County and the compressor station is on the Southern Ute Indian Reservation. Durango has a population of 13,000, having grown 14 percent since 1980. There are 4,365 permanent housing units in Durango with a moderately low vacancy rate of 5.61 percent. Almost 1,400 temporary accommodations are available. Durango is patrolled by 15 policemen and has two full service hospitals. Approximately half of La Plata County lives in Durango.

New Mexico Counties. Eddy, Lea, Lincoln, McKinley, San Juan, Socorro, Torrance, and Valencia counties are all traversed by either the El' Paso alternatives or Transwestern pipeline. Although only the San Juan, McKinley, and Cibola Counties are affected by the El Paso project, all New Mexico counties are discussed here to conserve space, provide continuity, and avoid repetition. Valencia is defined to include Cibola County, established in 1984, because the majority of available data predate the separation of Cibola County from Valencia County. Profiles of these counties are presented in Tables 3.1-13 and 3.1-14.

The cities of Gallup, Albuquerque, Grants, Socorro, Belen, Roswell, Artesia, Farmington, Carlsbad, and Hobbs are profiled in Table 3.1-15 because they may be affected by an influx of temporary construction personnel working on the proposed or alternative modifications. The average daily room rate in Albuquerque in 1984 was $48.76 and occupancy rates averaged 77.32 percent in that year. Rates are lower in the rest of New Mexico, $37.32 in 1984, as are occupancy rates, 64.65 percent in 1984 [Pannell, Kerr, Forster, 1984]. The state as a whole has 439 establishments with 22,695 guest rooms for rent [Bureau of the Census, 1982 Census of Service Industries].

3.6.2.8.2 Traffic

The ~~eleven~~ fourteen loop routes cross minor roads; a few state roads, and Interstate 40. Table 3.6-18 includes the 600 MMcfd alternatives crossings.

Table 3.6-18

TRANSPORTATION CORRIDOR CROSSINGS, EL PASO 600 MMcfd ALTERNTATIVES

Loop	U.S. Interstate	U.S. Federal	State	County and State	Railroad
Blanco	-	-	NM 173	6	-
Window Rock B	-	-	AZ 264	20+	AT&SF
Window Rock A	-	-	-	0	-
Navajo B	-	-	-	2+	-
Navajo A	-	-	AZ 77	10+	-
Leupp	-	US 89	-	14	-
Williams A	-	-	-	7	-
Williams B	I-40	-	-	7	AT&SF(4)
Seligman	I-40 (2)	-	-	10+	-
Hackberry	I-40	-	AZ 95	20	-
Laguna	-	-	NM 53	4	-
Chaco	-	-	-	4	-
White Rock	-	-	-	3	-
Gallup	-	-	-	3	-

3.6.2.8.3 Noise

Estimated noise levels for the 600 MMcfd Alternatives would be similar to those discussed for the Base Case. Differences in the estimated noise levels would be expected along the 600 MMcfd alternatives due the increased length of the looping.

3.6.2.8.4 Recreational Resources

Blanco Loop. No designated recreational sites are within the mile-wide pipeline corridor. The canyons and mesas east of the Animas River Valley, however, are used on an informal basis for hiking, sightseeing, wood gathering, rabbit hunting, and similar pursuits. There are many dirt roads in the area because of past oil and gas exploration activities.

Chaco, White Rock, Gallup, Window Rock B, Window Rock A, Navajo B, and Navajo A Loops. No designated recreational sites are within the mile-wide pipeline corridor. ~~The reservation lands are used on an informal basis for wood gathering, hunting where permitted, and other activities.~~ Recreational opportunities on lands under the jurisdiction of the Navajo Nation are similar to those on private lands. While hiking, exploring and birdwatching may be acceptable, camping, hunting, disturbance or removal of natural and cultural resources would be prohibited, restricted or require prior permission.

Leupp Loop. No designated recreational sites are within the mile-wide corridor in the Coconino NF and the City of Flagstaff. The lava fields at the east end of the loop are on BLM and private lands and probably are visited on an informal basis.

Williams A Loop. No developed recreational sites are within the analysis corridor which traverses Kaibab NF and private lands.

Williams B Loop. No developed recreational sites are within the mile-wide corridor. The loop is within the Kaibab NF land where informal recreational activities such as hiking, sightseeing, driving for pleasure take place.

Seligman Loop. No designated recreational sites are within the mile-wide corridor. Recreational use by hunters and trappers occurs in the areas bordering the loop. The existing pipeline roads offer access to recreational users.

Hackberry Loop. No designated recreational sites are within the mile-wide corridor. Informal recreational activities occur on public lands. Recreational use by hunters and trappers occurs in the areas bordering the loop. The existing pipeline roads offer access to recreational users.

Laguna Loop. The loop between MP 333.79-334.50 would pass through the edge of a baseball field on the New Mexico State

University branch campus in Grants. It is not known whether this ballfield is open to the general public. Between MP 337.50-337.78 there is a go-cart track constructed of up-ended tires around the perimeter; small bleachers are at one end. The name of the track is Uranium Capitol Speedway, and it is on private land. No other recreational sites are within the corridor.

3.6.2.9 Land Ownership/Use

El Paso's 600 MMcfd Alternatives consists of two cases: the 100/500 MMcfd and 200/400 MMcfd. The 100/500 case traverses three counties in New Mexico (San Juan, McKinley, and Cibola) and five in Arizona (Apache, Navajo, Coconino, Yavapai, and Mohave) for a total of 211.3 miles. The 200/400 case traverses the same counties as the 100/500 case with the exception of Cibola County, New Mexico, for a total of 225.3 miles. Table 3.6-19 shows the approximate number of miles crossed in each county by loop segment and also shows the ownership status of the lands. Land uses by county and loop segment are presented in Table 3.6-20 and the approximate locations of each are shown on the maps in Volume IV. Table 3.6-21 summarizes the rules and regulations of the various administrative agencies.

Blanco Loop (MP 0-14.6) would cross approximately 14.6 miles in San Juan County, New Mexico. The majority of the land is controlled by the BLM; the land use is grazing. San Juan County has no identified land use plans for the area [Traeger, 1986]. Both the 100/500 and 200/400 cases would use this loop.

Window Rock B Loop (MP 85.3-117.0) is located in both New Mexico and Arizona (McKinley and Apache Counties, respectively). The first 3.6 miles are within the Navajo Nation boundary; these lands require tribal consent before BIA approval of any land transaction. At approximately MP 88 it enters the checkerboard area (Navajo Tribal Trust Lands) which continues to the state border. The majority of the Indian land crossed in this area is ~~Individual Allotment land~~ Navajo Allotted Trust Lands with the exception of one mile of ~~Navajo Fee Simple lands~~ Navajo Fee Patent Land. ~~These lands are administered by the Bureau of Indian Affairs (BIA); "as part of a trust responsibility, the BIA must act on the behalf of the Indian Allottees." [Deschine, 1986]. The fee lands are administered by the Navajo Nation.~~ The allotted land requires the consent of the landowner before BIA approval of any land transaction. The fee land is considered privately owned and can be owned individually by a Navajo or by the Navajo Nation. The land use is grazing. ~~with the exception of the area around Twin Lakes. The land use near this small community includes a chapter building, residential, and some grazing.~~ In Arizona, this loop goes through about 10 miles of the Navajo Nation Forest. This land is used for commercial timbering and grazing in conjunction with Navajo Forest Product Industries. This loop is included in both cases.

Table 3.6-19
LAND OWNERSHIP, EL PASO 600 MMcfd ALTERNATIVES

Alternative Loop	County, State	Total	Private Miles	Private %	BLM Miles	BLM %	State Miles	State %	Indian Miles	Indian %	FS Miles	FS %
Blanco 1/	San Juan, NM	14.6	1.5	(10)	12.1	(83)	1.0	(7)	-	-	-	-
Chaco 1/ (200/400)	San Juan, NM	6.5	1.8	(28)	-	-	-	-	4.7	(72)	-	-
White Rock 1/ (200/400)	San Juan, NM	5.4	-	-	-	-	-	-	5.4	(100)	-	-
Gallup 1/ (200/400)	McKinley, NM	5.2	-	-	-	-	-	-	5.2	(100)	-	-
Window Rock B 1/,2/	McKinley, NM	14.0	4.0	(29)	-	-	-	-	10.0	(71)	-	-
	Apache, AZ	17.7	-	-	-	-	-	-	17.7	(100)	-	-
Subtotal		31.7	4.0	(13)	-	-	-	-	27.7	[87]	-	-
Window Rock A 2/	Apache, AZ	5.8	-	-	-	-	-	-	5.8	(100)	-	-
Navajo B 1/ 2/	Navajo, AZ	40.7	8.0	(20)	-	-	-	-	32.7	(80)	-	-
Navajo A 1/	Navajo, AZ	9.0	4.0	(44)	-	-	-	-	5.0	(56)	-	-
Leupp 1/, 2/, 3/	Coconino, AZ	20.7	5.5	(27)	-	-	2.5	(12)	-	-	12.7	(61)
Williams A 2/, 3/	Coconino, Az	13.3	2.4	(18)	-	-	-	-	-	-	10.9	(82)
Williams B 2/, 3/	Coconino, AZ	1.0	-	-	-	-	-	-	-	-	1.0	(100)
	Yavapai, AZ	15.4	1.0	(6)	-	-	-	-	-	-	14.4	(94)
Subtotal		16.4	1.0	[6]	-	-	-	-	-	-	15.4	[94]
Seligman 1/, 2/	Yavapai, AZ	30.0	15.0	(50)	-	-	15.0	(50)	-	-	-	-
Hackberry 1/	Mohave, AZ	26.0	10.0	(38)	13.5	(52)	2.5	(10)	-	-	-	-
Laguna 1/ (100/500)	Cibola, NM	3.1	2.7	(87)	-	-	-	-	-	-	0.4	(13)
100/500 TOTAL		211.3	54.1	[26]	25.6	[12]	21.0	[10]	71.2	[34]	39.4	[19]
200/400 TOTAL		225.3	53.2	[24]	25.6	[11]	21.0	[9]	86.5	[38]	39.0	[17]

1/ BLM 1:100,000 Surface Management Status Maps
2/ BLM 1:500,000 Land Status Maps
3/ Forest Service 1:126,720 Forest Service Maps

Table 3.6-20

LAND USE, EL PASO 600 MMcfd ALTERNATIVES

Alternative Loop	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	%	Timber/ Forestland Miles	%	Irrigated/ Non-Irrigated Agriculture Miles	%	Residential Miles	%	Commercial Miles	%	Other Miles	%
Blanco	San Juan, NM	14.6	14.6	(100)	-	-	-	-	-	-	-	-	-	-
Chaco (200/400)	San Juan, NM	6.5	-	-	-	-	6.5	(100)	-	-	-	-	-	-
White Rock (200/400)	San Juan, NM	5.4	5.4	(100)	-	-	-	-	-	-	-	-	-	-
Gallup (200/400)	McKinley, NM	5.2	5.2	(100)	-	-	-	-	-	-	-	-	-	-
Window Rock B	McKinley, NM	14.0	14.0	(100)	-	-	-	-	-	-	-	-	-	-
	Apache, AZ	17.7	7.7	(44)	10.0	(56)	-	-	-	-	-	-	-	-
Subtotal		31.7	21.7	(68)	10.0	(32)	-	-	-	-	-	-	-	-
Window Rock A	Apache, AZ	5.8	5.8	(100)	-	-	-	-	-	-	-	-	-	-
Navajo B	Navajo, AZ	40.7	40.7	(100)	-	-	-	-	-	-	-	-	-	-
Navajo A	Navajo, AZ	9.0	9.0	(100)	-	-	-	-	-	-	-	-	-	-
Leupp	Coconino, AZ	20.7	4.0	(19)	10.7	(52)	-	-	4.0	(19)	-	-	2.0 1/	(10)
Williams A	Coconino, AZ	13.3	-	-	13.3	(100)	-	-	-	-	-	-	-	-
Williams B	Coconino, AZ	1.0	-	-	1.0	(100)	-	-	-	-	-	-	-	-
	Yavapai, AZ	15.4	1.0	(6)	14.4	(94)	-	-	-	-	-	-	-	-
Subtotal		16.4	1.0	[6]	15.4	[94]	-	-	-	-	-	-	-	-
Seligman	Yavapai, Az	30.0	29.5	(98)	-	-	-	-	-	-	-	-	-	-
Hackberry	Mohave, AZ	26.0	16.0	(62)	-	-	-	-	10.0	(38)	-	-	-	-
Laguna (100/500)	Cibola, NM	3.1	1.6	(51)	-	-	-	-	1.2	(39)	0.3	(10)	-	-
100/500 TOTAL		211.3	143.9	[68]	49.4	[23]	0.0	[0]	15.2	[7]	0.8	[0]	2.0 1/	[1]
200/400 TOTAL		225.3	152.9	[68]	49.4	[22]	6.5	[3]	14.0	[6]	0.5	[0]	2.0 1/	[1]

1/ ESA (Environmental Study Area)

( ) Percentanges within county

[ ] Total percentages within loop or line

Table 3.6-21

FEDERAL, STATE AND COUNTY LAND USE REGULATIONS AND POLICIES FOR EL PASO 600 MMcfd ALTERNATIVES

Administrative Agency	Document	Policies/Requirements
FEDERAL		
Department of Interior		
Bureau of Land Management		locate in existing utility corridors
Albuquerque District	Resource Management Plan	within corridor
Farmington Resource Area	Resource Management Plan	no designated utility corridor
Phoenix District	Resource Management Plan	no designated utility corridor
Yuma District	Resource Management Plan	no designated utility corridor
Department of Agriculture		
National Forest Service		locate in existing utility corridors
Coconino National Forest	Land and Resource Management Plan	within corridor
Kaibab National Forest	Land and Resource Management Plan	within corridor
NAVAJO NATION		consultation with Tribal Officials
STATE		
New Mexico State Lands Commission	Rules and Regulations Concerning the Sale, Lease, and Other Dispositions of State Trust Lands, 1984	apply for a grant to construct
Secretary of State, Arizona	Official Compilation of Administrative Rules and Regulations, 1977	apply for right-of-way and consent from lessee
COUNTY		
Apache, Arizona	Apache County Comprehensive Plan	proposed route not in plan's jurisdiction
Coconino, Arizona	Coconino County General Plan 1990, 1975	no reference to pipeline regulations
Mohave, Arizona	Mohave Valley South, 1980	no reference to pipeline regulations
CITY		
Flagstaff, Arizona	Growth Management Guide, 2000, Draft, 1986	apply for conditional use permit
Grants, New Mexico	Comprehensive Zoning Ordinance for the City of Grants	no reference to pipeline regulations

Window Rock A Loop (MP 118.7-124.5) is the same as the Base Case; refer to Section 3.6.1.9. This loop is included in both 600 MMcfd cases.

Navajo B Loop (MP 152.4-193.1) is located in Navajo County, Arizona. It is within the boundaries of the Navajo Nation but traverses some private land not controlled by the nation. The land is solely used for grazing. The county has no plans for the private land within the Navajo Nation boundaries [Placios, 1986]. ~~It passes within 0.5 mile of the community of Dilkon which has a BIA school, chapter building, residences, some grazing, and a mission.~~ This loop is included in both cases.

Navajo A Loop (MP 156.5-165.5) is the same as the Base Case (refer to Section 3.6.1.9) and is included for both the 100/500 and 200/400 cases.

Leupp Loop (MP 229.6-250.3) is within the boundaries of the Coconino National Forest except for the first 2.5 miles. The private land crossed by the loop within the forest boundaries is not controlled by the FS. From approximately MP 248 to the end, with the exception of 1/2 mile between MP 249.2 to 249.7, it traverses Forest land that is set aside as the Elden Environmental Study Area (ESA). "The Elden ESA is a popular outdoor classroom for schools, parents, groups, individuals who want to teach principles of environmental education" [Coconino NF Plan, 1985]. A major shopping center is located at MP 247. The ~~entire area~~ south side of the loop from MP 246 to 250.3 is high density residential; while the north side of the loop, including the ROW, supports a high density of deer during winter, in spite of its immediate proximity to the city of Flagstaff. The City of Flagstaff considers natural gas pipelines as a conditional use within all zones. This loop is included in both cases.

Williams A Loop (MP 263.6-275.9) is located in Coconino County, Arizona. The majority of the land is controlled by the FS. The proposed loop begins west of Flagstaff in the Coconino NF until about MP 264 where it enters the Kaibab NF. The parcels of private land it traverses within the forest boundaries are not controlled by the Forest Service. Coconino County has no plans for these areas [Coconino County, 1975]. The proposed project is within existing utility corridors in both forests and the land use is commercial timbering. This loop is included in both cases.

Williams B Loop (MP 283.4-299.8) is located totally in the Kaibab NF within an existing utility corridor. Coconino County has no plans for the mile of private land crossed within the forest boundaries [Coconino County, 1975]. The land use is commercial timbering with grazing. This loop is included in both cases.

Seligman Loop (MP 317.6-347.8) is located in Yavapai County, Arizona. The land ownership is split evenly between state and private, and the land use is grazing with the exception of 0.5

mile around MP 338 which the state leases for commercial use. Yavapai County has no identified land use plans for the area [Inman, 1986]. This loop is included in both cases.

Hackberry Loop (MP 415.9-441.9) is located in Mohave County, Arizona. The route near MP 416.0 passes within 0.5 mile of the Ford Motor Automotive Proving Grounds. At approximately MP 432 it enters an area that is owned by the Mohave Valley South Area Plan adopted by Mohave County in 1980. This land is zoned agricultural/residential for the first seven miles and the last three are zoned residential. There are no homes identified within 100 feet of the route. This loop is also included in both cases. The western end of the loop follows the BLM Yuma District Utility Corridor No. 3 to the Topock Station.

Laguna Loops (MP 330.1-332.2, 333.8-334.5, and 337.4-337.8) are located in Cibola County, New Mexico. The first loop would pass within 100 feet of six homes. The second loop would traverse 0.25 mile of BLM land leased to the Cibola NF for administrative use, would traverse New Mexico State University (NMSU) Grants Campus ballfield, and would pass within 100 feet of one of the main buildings. The third loop would traverse a mining supply company on both sides of the existing pipeline. The City of Grants has no specific zone regulations for natural gas pipelines. This loop is only included in the 100/500 case.

Bondad Compressor Station is located on private land and the surrounding land use is grazing.

Chaco Loop (MP 12.9-19.4) is also located in San Juan County. The land use is irrigated cropland within Blocks I and IV of the Navajo Indian Irrigation Project controlled by the Navajo Nation. Some of the land is also used for grazing. Only the 200/400 case includes this loop.

White Rock Loop (MP 43.6-49.0) is the third expansion in San Juan County. It is solely located on Navajo Indian lands administered by the Navajo Nation. Grazing is the primary land use. Only the 200/400 case includes this loop.

Gallup Loop (MP 65.1-70.3) is located in McKinley County, New Mexico, on Navajo Nation land. Grazing is the prime use. McKinley County has no land use plans [Quintana, 1986]. This loop is included in the 200/400 case only.

3.6.2.10 Cultural Resources

3.6.2.10.1 Archaeology

The cultural resources located in the mile-wide corridors associated with the El Paso 600 MMcfd Alternative loops are presented in two tables which summarize numbers of sites and their National Register status and data on site types (see Tables

3.6-22 and 3.6-23). The data in these tables reflect the information available as of April, 1986.

The Hackberry Loop has ~~two sites, an historic bridge and~~ one site, a lithic scatter. The Window Rock A Loop has no sites. Site types for the Navajo A Loop are shown for the Base Case.

The tables summarizing and interpreting the cultural resources for the El Paso 600 MMcfd Alternatives are based on the data presented in some detail in the Cultural Resources Technical Report. Details on previous survey coverage and an overview of the prehistory, history, and ethnohistory of the project area are also contained in the technical report.

100/500 MMcfd Alternative

Summary. Of the 211.3 miles of looping proposed for the El Paso 100/500 MMcfd El Paso Expansion Project, 20.55 miles (9.7 percent) have been covered by previous surveys. (The original survey done of the entire El Paso line by Wendorf et al [1956] was not done to BLM standards applying to field methods currently employed). Another 14.8 miles of survey have occurred directly adjacent to (perhaps partially covering) the proposed pipeline loops. A total of 429 cultural resource sites have been documented within the mile-wide analysis corridors of these loops. ~~One site (the Needles Bridge) has been nominated to the National Register.~~ One site has been determined to be ineligible.

There are four high sensitivity pipeline segments along these loops.

200/400 MMcfd Alternative

Summary. Of the 225.3 miles of looping proposed for the El Paso 200/400 MMcfd Expansion Project, 34.35 miles (15.2 percent) have been covered by previous surveys. (The original survey done of the entire El Paso line by Wendorf et al [1956] was not done to BLM standards applying to field methods currently employed). Another 14.6 miles of survey have occurred directly adjacent to (perhaps partially covering) the proposed pipeline loops. A total of 472 cultural resource sites have been documented within the mile-wide analysis corridors of these loops. ~~One of these sites (Needle Bridge) has been nominated to the National Register.~~ One site has been determined to be ineligible.

There are five high sensitivity pipeline segments along these loops.

Table 3.6-22

KNOWN CULTURAL RESOURCE SITES, EL PASO 600 MMcfd ALTERNATIVES

Pipeline Loop and State	Sites and National 1/ Register Status			
	Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
100/500 MMcfd				
New Mexico				
Blanco	0	0	0	10
Laguna	0	0	0	3
New Mexico/Arizona				
Window Rock B	0	0	0	70
Arizona				
Window Rock A	0	0	0	0
Navajo B	0	0	1	63
Navajo A	0	0	0	6
Leupp	0	0	0	205
Williams A	0	0	0	48
Williams B	0	0	0	21
Seligman	0	0	0	2
Hackberry	0	0	0	1
Total Sites	0	0	1	429
200/400 MMcfd (includes the above loops except the Laguna plus the loops listed below)				
New Mexico				
Chaco	0	0	0	29
White Rock	0	0	0	2
Gallup	0	0	0	15
Total Sites	0	0	1	472

1/ National Register status here refers only to the results of official determinations. Many other sites may meet the eligibility criteria but have not been formally evaluated.

Table 3.6-23

KNOWN CULTURAL RESOURCE TYPES, EL PASO 600 MMcfd ALTERNATIVES

Type	Pipeline 1/ Loops										
	Bla	Cha	Wht Rck	Gal	Lag	Win B	Nav B	Leu	Wil A	Wil B	Sel
Habitation											
Roomblock	1	-	1	3(1)	-	2(1)	-	33(2)	-	1	-
Pithouse	1	-	-	2	-	-	-	48	11	-	-
Pithouse Village	-	-	-	-	-	-	-	-	3	-	-
Pithouse+ Fieldhouse	-	-	-	-	-	-	-	-	4	-	-
Mounds	-	-	-	-	-	7	-	-	-	-	-
Scatters											
Lithic	-	10(4)	-	-	2	(1)	2(1)	-	12	5(1)	1
Ceramic	-	-	-	3(6)	-	8(3)	5(12)	34(1)	-	1	-
Groundstne	1(1)	-	(1)	-	-	(1)	-	-	-	-	-
Lithic+ Ceramic	1(2)	1	(1)	(3)	1	(2)	14(21)	2	5(1)	9	-
Lithic+ Grndstne	-	1(2)	-	-	-	-	-	-	-	-	-
Lithic+Cer+ Grndstne	-	-	-	-	-	(5)	-	-	-	-	-
Bone	-	(2)	-	-	-	-	-	-	-	-	-
Other	-	2	-	-	-	-	-	-	-	-	-
Features											
Fieldhouse	-	-	-	-	-	-	-	51	4	-	-
Structures	1	-	-	1	-	1	36	3	(1)	-	-
Kiva	-	-	-	1	-	-	-	2	-	-	-
Depression	-	-	-	1	-	-	-	-	-	-	-
Hearth(s)	-	4	-	1(1)	-	-	-	-	-	-	-
Rockshelter	-	-	-	-	-	-	-	-	2	-	-
Cave	-	-	-	-	-	-	-	6	-	-	-
Rock Align.	-	-	1	1(1)	-	-	-	1	-	-	-
Stone Circle	-	-	-	-	-	-	-	-	-	1	1
Petroglyphs	1(1)	-	-	-	-	-	-	2	-	-	-
Burial	-	-	-	-	-	1	-	1	-	-	-
Quarry	-	-	-	-	-	-	5	-	-	-	-

Table 3.6-23 (continued)

KNOWN CULTURAL RESOURCE TYPES, EL PASO 600 MMcfd ALTERNATIVES

	Pipeline Loops 1/										
Type	Bla	Cha	Wht Rck	Gal	Lag	Win B	Nav B	Leu	Wil A	Wil B	Sel
Cistern	-	-	-	(1)	-	-	-	-	-	-	-
Granary	-	-	-	-	-	-	-	2	-	-	-
Trail	-	-	-	-	-	-	-	1	-	-	-
Water Control	-	-	-	-	-	-	-	1	1	-	-
Historic											
Trash	1	(5)	-	-	-	(5)	-	-	2	3	-
Dump	-	-	-	-	-	(1)	(1?)	-	-	-	-
Structure	1	4(1)	-	-	-	-	1	4	2	-	-
Ramada	-	(1)	-	-	-	(4)	-	-	-	-	-
Corral/Pen	1	6(3)	-	-	-	1(2)	-	-	-	-	-
Corral+ Hogan	-	1	-	-	-	7	-	-	-	-	-
Hogan	-	-	-	1	-	23	-	-	-	-	-
Sweatlodge	-	-	-	-	-	15(6)	-	-	-	-	-
Oven/Hearth	-	-	-	(1)	-	1(1)	-	-	-	-	-
Fire Altered Rock	-	-	-	-	-	4(1)	-	-	-	-	-
Wood Chips	-	-	-	-	-	(3)	-	-	-	-	-
Ceramics	-	-	-	-	-	(10)	-	-	-	1	-
Stone Circle	-	-	-	-	-	-	-	1	-	-	-
Rock Align.	-	-	-	-	-	-	-	1	-	-	-
Sheep Camp	-	-	-	-	-	-	-	-	1	-	-
Water/Soil Control	-	(1)	-	-	-	-	-	1	-	-	-
Burial	-	-	-	-	-	-	-	1	-	-	-
Other	-	(4)	-	-	-	-	-	-	-	-	-
Unknown	1	-	-	1	-	-	1	10	-	-	-
TOTALS	10	29	2	15	3	70	64	205	48	21	2

1/ Bla = Blanco Loop; Cha = Chaco Loop; Whi Rck = White Rock Loop; Gal = Gallup Loop; Lag = Laguna Loop; Win B = Window Rock B Loop; Nav B = Navajo B Loop; Wil A = Williams A Loop; Wil B = Williams B Loop; Sel = Seligman Loop.

3.6.2.10.2 American Indian Concerns

See paragraph 1 of Section 3.6.1.10.2 for a discussion of the methodology used regarding American Indian concerns.

Because several of the proposed expansion loops (Chaco, White Rock, Gallup, Window Rock A and B, Navajo A and B) traverse important sections of the Navajo Indian Reservation in Arizona and New Mexico, the Navajo Tribe was contacted directly by an ethnographer who has long worked with them. He conducted interviews with numerous tribal officials at both the tribal and chapter levels. A list of those contacted is presented in the cultural resources technical report. The concerns expressed for the proposed expansion loops are the same as those presented in Section 3.6.1.10.2.

The Hopi Indian Tribe is concerned about the possibility that blasting during the construction of parts of the Navajo B Loop may scare away golden eagles from their sacred nesting places east and northeast of Dilkon.

The Pueblo of Zuni did not express any site-specific concerns, but did emphasize their concern regarding any human burials which may be encountered along the route.

Finally, the Southern Ute Indians wanted to know whether the proposed expansion would involve reservation lands. They were informed that none of the new pipeline loops would cross their reservation and that the expansion of the capacity of the Bondad Compressor Station would be done on the land already used by the existing facility.

3.6.2.11 Paleontological Resources

Paleontological resources for the El Paso 600 MMcfd alternatives have been divided into looped segments. Table 3.6-24 lists the formations for both the 100/500 and 200/400 MMcfd alternatives. The significance criteria were discussed in Section 3.1.11 with a more detailed discussion of the paleontological resources presented in the Paleontological Resources Assessment Technical Report [Morales et al., 1987].

3.6.2.12 Visual Resources

Refer to Section 3.6.1.12 for a description of the scenic environment of the study area.

Blanco Loop

MP 7.9-9.9, VRM/VQO: BLM Class III
Description: BLM Farmington Resource District. The landform consists of high desert plateau with a changing topography of

Table 3.6-24

PALEONTOLOGICAL FORMATIONS,
EL PASO 600 MMcfd ALTERNATIVES

Age	Formation	Potential 1/ Vertebrate/ Invertebrate	Sensitivity
Laguna Loop (100/500 Only)			
Late Triassic	Chinle Formation	L/L	No
Upper Cretaceous	Dakota Sandstone	H/H	Yes
Upper Cretaceous	Mancos Formation	L/H	No
Upper Jurassic	Morrison Formation	L/H	No
Upper Triassic	Wingate Sandstone	L/L	
Uncertain Quaternary	Quaternary Alluvium	L/L	No
Middle Jurassic	Todilto Formation	H/H	Yes
Blanco Loop			
Quaternary	Quaternary Alluvium	L/L	No
Paleocene	Nacimiento Formation	H/H	Yes
Lower Eocene	San Jose Formation	H/H	Yes
Window Rock A Loop	(See Table 3.6-12)		
Window Rock B Loop			
Upper Cretaceous	Menefee Formation	L/H	No
Upper Cretaceous	Crevasse Canyon Formation	M/M	No
Quaternary	Quaternary Alluvium	L/L	No
Upper Cretaceous	Gallup Sandstone	L/H	No
Upper Cretaceous	Mancos Shale	L/H	No
Upper Cretaceous	Dakota Sandstone	L/H	No
Upper Jurassic	Morrison Formation	H/L	Yes
Middle Jurassic	Entrada Sandstone	L/L	No
Upper Triassic	Wingate Sandstone	L/H	No
Late Triassic	Chinle Formation	H/H	Yes
Lower Permian	De Chelly Sandstone	M/L	No
Navajo A Loop	(See Table 3.6-12)		
Navajo B Loop			
Uppermost Miocene	Bidahochi Formation	H/L	Yes
Upper Triassic	Wingate Sandstone	M/L	No
Quaternary	Quaternary Alluvium	L/L	No
Late Triassic	Chinle Formation	H/H	Yes
Leupp Loop			
Quaternary	Quaternary Alluvium	H/H	Yes
Quaternary	Quaternary Basalt	L/L	No
Permian	Kaibab Formation	L/M	No
Lower Middle Triassic	Moenkopi Formation	H/M	Yes

Table 3.6-24 (continued)

PALEONTOLOGICAL FORMATIONS, EL PASO 600 MMcfd ALTERNATIVES

Age	Formation	Potential 1/ Vertebrate/ Invertebrate	Sensitivity
Williams A Loop			
Quaternary	Quaternary Basalt	L/L	No
Permian	Kaibab and Toroweap Formations Undifferentiated	L/M	No
Seligman Loop			
Quaternary	Quaternary Basalt	L/L	No
Tertiary/ Quaternary	Tertiary to Quaternary Sediments Undifferentiated	L/L	No
Devonian/ Mississippian	Redwall Limestone and Martin Formation Undifferentiated	M/H	No
Precambrian	Precambrian Granite	L/L	No
Hackberry Loop			
Tertiary/ Quaternary	Tertiary to Quaternary deposits Undifferentiated	L/L	No
Tertiary/ Quaternary	Tertiary to Quaternary Volcanic Rocks	L/L	No
Precambrian	Precambrian gneiss and granite	L/L	No
Chaco Loop (200/400 only)			
Paleocene	Nacimiento Formation	H/H	Yes
Lower Paleocene	Ojo Alamo Sandstone	H/L	Yes
Quaternary	Quaternary Alluvium	L/L	No
Upper Cretaceous	Kirtland Shale	H/L	Yes
White Rock Loop (200/400 only)			
Upper Cretaceous	Menefee Formation	L/H	No
Quaternary	Quaternary Alluvium	L/L	No
Gallup Loop (200/400 only)			
Upper Cretaceous	Menefee Formation	L/H	No

1/ L = Low, M = Moderate, H = High

hills and plains. The vegetation consists of pine and juniper woodlands and high desert grasslands. Modifications include the existing El Paso and MAPCO pipelines and State Route 173.

Leupp Loop

MP 232-250.3, VRM/VQO: Class M,R
Description: Coconino National Forest. The landform consists of gently sloping desert transition to higher elevation slopes at the base of the San Francisco Peaks. The vegetation consists of chaparral, desert grassland, mountain grassland, pine forests, and juniper forests. Modifications include the existing El Paso pipeline, transmission lines, US Highways 89 and 180, and Forest Service access roads.

Williams A Loop

MP 263.5-268.5, VRM/VQO: FS Class PR,M
Description: Coconino National Forest. Refer to description above.

MP 268.5-276.9, VRM/VQO: FS Class PR,M
Description: Kaibab National Forest. The landform consists of higher elevation plateau passing between Sitgreaves Mountains. The vegetation consists of chaparral, desert grassland, mountain grassland, pine and juniper forests. Modifications include the existing El Paso pipeline, the town of Parks, Interstate 40, interspersed ranches, jeep trails, mines, transmission lines, and access roads.

Williams B Loop

MP 284-288.2, VRM/VQO: FS Class PR,M
Description: Kaibab National Forest. The landform consists of higher elevation plateau passing between Sitgreaves Mountains. The vegetation consists of chaparral, desert grassland, mountain grassland, pine, and juniper forests. Modifications include the existing El Paso pipeline, ~~the town of Parks,~~ Interstate 40, interspersed ranches, jeep trails, mines, transmission lines, and access roads.

3.6.3 Northwest Expansion Project

3.6.3.1 Air Quality

The Northwest Expansion extends approximately 162 miles from the south of Muddy Creek Compressor Station at Opal, Wyoming, to the Ignacio Compressor Station at Ignacio, Colorado. The nearby PSD Class I areas include Bridger Wilderness Area in Uinta County, Wyoming, Canyonlands National Park in ~~Wayne~~ San Juan County, Utah, and Mesa Verde National Park in ~~La Plata~~ Montezuma County, Colorado. These PSD Class I areas are within an 80-mile range of the pipeline.

Existing air quality along the pipeline is good with the exception the federal TSP standards which were exceeded due to rural fugitive dust. Air quality measurements at the Durango Station, Colorado (Table 3.6-25) show attainment of all NAAQS. However, annual TSP measurements at Grand Junction in Mesa County, Colorado, are above the federal annual secondary standard. Moreover, TSP measurements at Telluride, Colorado, exceed both the federal 24-hour and annual primary standards. As shown in Table 3.6-25, TSP measurements at Green River in Emery, Utah, exceed both 24-hour and annual secondary federal standards. The 24-hour average TSP at Vernal in Uintah County, Utah, are slightly above the secondary federal standard. Although exceedances of the federal standards occur in both Utah and Colorado due to rural fugitive dust, Lincoln and Sweetwater Counties of Wyoming (Table 3.6-25) are designated as in attainment for all pollutants, with the overall air quality of these counties considered good.

3.6.3.2 Geology

The Northwest Pipeline Expansion would extend through a variety of geologic features in Wyoming, Colorado, and Utah. The geologic and physiographic features along the loops of the existing lines are discussed below and presented in Table 3.6-26.

No major slope stability or ground subsidence problems have been identified along the Muddy Creek, Green River, Cisco, Moab, and Cahone Loops ~~or at Vernal Station~~. Considerable landslide hazards do exist along the Rangely Loops A and B.

No unique geologic features of significant interest occur along any of the routes with the exception of portions of the Moab Loop which cross areas of exposed bedrock which has weathered into unusual forms.

Seismicity varies from low to moderate throughout the region. Earthquake ground acceleration values, which are estimated to have a 90 percent probability of not being exceeded in 50 years, vary from less than four percent to about 10 percent of gravity for the entire project. No known Quaternary faults would be crossed with the possible exception of the Moab and Cahone Loops.

Muddy Creek Loop. The route for the Muddy Creek Loop in southwestern Wyoming lies within the Wyoming Basin physiographic province. The route is underlain by consolidated sedimentary rocks of Tertiary age and unconsolidated Quaternary alluvial and eolian deposits consisting chiefly of silt, sand, and gravel. The loop traverses flat to mildly rolling terrain ranging from 6,280 to 6,648 feet.

Table 3.6-25

SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO, UTAH, AND WYOMING

		TSP (ug/m^3)		CO (mg/m^3)		O$_3$ (ppm)	NO$_2$ (ug/m^3)		SO$_2$ (ug/m^3)			
Station	Year	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr	Maximum 1-Hr	Max 24-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean
COLORADO												
Durango	1982	136	53	-	-	-	-	-	-	-	-	-
	1983	182	60	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Cortez	1982	82	35	-	-	-	-	-	-	-	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Pagosa Springs	1982	376	120	-	-	-	-	-	-	-	-	-
	1983	268	10	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Mesa Verde	1982	61	7	-	-	-	-	-	-	-	-	-
	1983	33	8	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Meeker	1982	225	55	-	-	-	-	-	-	-	-	-
	1983	131	43	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Grand Junction, 5th & Rod	1982	196	73	-	-	-	-	-	-	-	-	-
	1983	181	68	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Telluride	1982	310	79	-	-	-	-	-	-	-	-	-
	1983	233	76	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-

Table 3.6-25 (continued)

SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO, UTAH, AND WYOMING

Station	Year	TSP ($\mu g/m^3$)		CO (mg/m^3)		O_3 (ppm)	NO_2 ($\mu g/m^3$)		SO_2 ($\mu g/m^3$)			
		Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr	Maximum 1-Hr	Max 24-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean
WYOMING												
Evanston	1982	166	53	-	-	-	-	-	-	-	-	-
	1983	353	58	-	-	-	-	-	-	-	-	-
	1984	117	40	-	-	-	-	-	-	-	-	-
Kemmerer	1982	99	37	-	-	-	-	-	-	-	-	-
	1983	112	39	-	-	-	-	-	-	-	-	-
	1984	90	39	-	-	-	-	-	-	-	-	-
Granger	1982	188	37	-	-	-	-	-	-	-	-	-
	1983	116	29	-	-	-	-	-	-	-	-	-
	1984	75	29	-	-	-	-	-	-	-	-	-
Green River	1982	106	38	-	-	-	-	-	-	-	-	-
	1983	118	38	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	-	-	-	-
Rock Springs, Landeen Site	1982	184	53	-	-	-	-	-	-	-	-	-
	1983	152	37	-	-	-	-	-	-	-	-	-
	1984	108	43	-	-	-	-	-	-	-	-	-
UTAH												
Bountiful	1982	191	39	17	7	0.15	338	38	-	419	157	26
	1983	206	43	17	9	0.15	-	-	-	262	105	26
	1984	173	53	15	7	0.17	-	-	-	314	183	26

Table 3.6-25 (continued)

SUMMARY OF RELEVANT AIR QUALITY DATA IN COLORADO, UTAH, AND WYOMING

		TSP (ug/m^3)		CO (mg/m^3)		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)			
Station	Year	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr	Maximum 1-Hr	Max 24-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean
UTAH (continued)												
Cedar City	1982	103	39	–	–	–	–	–	–	–	–	–
	1983	83	38	–	–	–	–	–	–	–	–	–
	1984	211	52	–	–	–	–	–	–	–	–	–
Cottonwood	1982	281	51	17	10	0.14	–	–	–	–	–	–
	1983	155	51	21	12	0.15	–	–	–	–	–	–
	1984	266	64	21	14	0.14	–	–	–	–	–	–
N. Salt Lake City	1982	269	68	–	–	–	–	–	–	550	183	26
	1983	–	–	–	–	–	–	–	–	105	52	26
	1984	242	100	–	–	–	–	–	–	367	157	26
Pleasant Grove	1982	266	44	–	–	–	–	–	–	–	–	–
	1983	113	41	–	–	–	–	–	–	–	–	–
	1984	480	68	–	–	–	–	–	–	–	–	–
Provo, University Avenue	1982	–	–	31	22	–	–	–	–	–	–	–
	1983	–	–	38	25	–	–	–	–	–	–	–
	1984	–	–	25	17	–	–	–	–	–	–	–
Green River	1982	167	64	–	–	–	–	–	–	–	–	–
	1983	262	54	–	–	–	–	–	–	–	–	–
	1984	189	61	–	–	–	–	–	–	–	–	–
Vernal	1982	76	35	–	–	–	–	–	–	–	–	–
	1983	110	34	–	–	–	–	–	–	–	–	–
	1984	163	39	–	–	–	–	–	–	–	–	–

Table 3.6-26

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, NORTHWEST EXPANSION PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Muddy Creek Loop (MP 437.3-402.7)	Wyoming Basin	Alluvium and dune sand; sedimentary rocks	Quaternary Tertiary	Starts at 6648 ft., ends at 6380 ft.; flat to rolling terrain	Unconsolidated gravels and sands; consolidated sandstone, claystone, marlstone, conglomerate, and oil shale
Green River Loop (MP 391.7-387.6)	Wyoming Basin	Sedimentary rocks	Tertiary	Starts at 6220 ft., ends at 6160 ft., rolling terrain	Consolidated sandstone, claystone, marlstone, and conglomerate
~~Vernal Station (MP 329.8)~~	~~Colorado Plateau~~	~~Alluvium and colluvium;~~ ~~sedimentary rocks~~	~~Quaternary~~ ~~Cretaceous~~	~~5600 ft., gently sloping surface~~	~~Unconsolidated sand and gravel; consolidated shale~~
Rangely Loop A (MP 277.7-246.9)	Colorado Plateau	Alluvium; sedimentary rocks	Quaternary Cretaceous	Starts at 5380 ft., ends at 7080 ft., stream bottom through mountainous terrain	Unconsolidated stream deposits; consolidated sandstone and shale
Rangely Loop B (MP 239.9-223.7)	Colorado Plateau	Alluvium; sedimentary rocks	Quaternary Cretaceous	Starts at 6200 ft., ends at 5000 ft.; stream bottom through mountainous and heavily dissected terrain	Unconsolidated stream deposits; consolidated sandstone and shale
Cisco Loop (MP 195.6-169.9)	Colorado Plateau	Alluvium; sedimentary rocks; sedimentary rocks	Quaternary Cretaceous Jurassic	Starts at 4500 ft., ends at 4560 ft.; rolling to hilly, heavily dissected terrain	Unconsolidated stream deposits; consolidated shale, mudstone, siltstone, limestone, sandstone, and conglomerate
Moab Loop (MP 145.6-110.8)	Colorado Plateau	Alluvium, eolian deposits; sedimentary rocks; sedimentary rocks	Quaternary Jurassic Triassic	Starts at 4480 ft., ends at 6080 ft.; stream bottom, mesa, and hilly terrain	Unconsolidated sand and gravel; consolidated shale, siltstone, and sandstone
Cahone Loop (MP 67.9-51.6)	Colorado Plateau	Eolian deposits; sedimentary rocks	Quaternary Cretaceous	Starts at 6740 ft., ends at 6980 ft.; rolling to hilly terrain	Unconsolidated silt and sand; consolidated shale, sandstone, and conglomerate

Green River Loop. The Green River Loop would traverse the Wyoming Basin Physiographic Province in southwestern Wyoming. The route crosses rolling topography ranging in elevation from 6,150 to 6,280 feet, which is underlain by Tertiary age consolidated sedimentary rocks.

~~Vernal Station. The existing Vernal Station is situated within the Uinta Section of the Colorado Plateau Physiographic Province in east-central Utah. The station is at an elevation of 5,600 feet and is underlain by Quaternary unconsolidated alluvium and colluvium and consolidated Cretaceous sedimentary rocks.~~

Rangely Loop A. The Rangely Loop A would lie within the Uinta Section of the Colorado Plateau Physiographic Province in northwest Colorado. The route would start at an elevation of 5,380 feet and follow Douglas and West Douglas Creeks upstream, through rugged mountainous terrain, to an elevation of 7,090 feet. The route crosses unconsolidated Quaternary alluvial deposits and consolidated Cretaceous age sedimentary rocks. Landsliding is a major problem along the route.

Rangely Loop B. The Rangely Loop B would be situated within the Colorado Plateau Physiographic Province in west-central Colorado. The pipeline would begin at an elevation of 6,620 feet and follow Trail Canyon and East Salt Creek downstream through rugged mountainous terrain. Farther south, the route diverges from East Salt Creek and crosses heavily dissected terrain to an elevation of 5,000 feet. The route is underlain by unconsolidated Quaternary alluvium and consolidated Cretaceous sedimentary rocks. The route crosses existing coal leases and producing gas fields.

Aerial reconnaissance along Rangely Loop B suggested that slope instability is a major problem along the route. A recent earthflow ~~was spotted~~ occurs just north of the north end of Rangely Loop B. Numerous landslides have been mapped on the steep slopes above the route [Whitney, 1981]. The Hunter Canyon and Wasatch Formations are particularly susceptible to landsliding.

Cisco Loop. The Cisco Loop would lie within the Colorado Plateau Physiographic Province in east-central Utah. The route crosses rolling to hilly, heavily dissected terrain at elevations ranging from 4,320 to 4,840 feet. The route traverses unconsolidated Quaternary alluvium and Jurassic and Cretaceous consolidated sedimentary rocks.

Moab Loop. The Moab Loop would lie within the Colorado Plateau Physiographic Province in southeastern Utah. The route would cross valley, rugged mesa, and hilly terrain ranging in elevation from 4,460 to 6,080 feet. The route is underlain by unconsolidated Quaternary alluvial and eolian deposits and consolidated Jurassic and Triassic sedimentary rocks.

Williams [1964] indicates six faults in the Spanish Valley and Kane Springs area, four of which are of probable preQuaternary age. Anderson and Miller [1979] have mapped two faults in Spanish Valley that are suspected of having Quaternary movement (i.e., within the last 2 to 3 million years). These are located parallel to this loop from MP 147.4-149.2 and MP 150.0-151.6.

Cahone Loop. The Cahone Loop would lie within the Colorado Plateau Physiographic Province in southwestern Colorado. The route traverses rolling to hilly terrain ranging in elevation from 6,760 to 7,020 feet. The route of the Cahone Loop is underlain by unconsolidated eolian deposits of Quaternary age and consolidated Cretaceous sedimentary rocks.

The southern end of the loop crosses a bedrock fault [Haynes et al., 1972], of probable preQuaternary age. Colman [1985] indicates that another fault at the southern end of the loop, (MP 51.5) has experienced movement during the Pleistocene epoch (i.e., between 10,000 and 2 million years ago).

3.6.3.3 Soil

The distribution of soil mapping units along the loops, and the characteristics of the individual soils that comprise the mapping units are presented in Appendix A. A summary of soil characteristics that would be encountered along each loop is presented below. This information has been summarized from numerous published and unpublished soil surveys as well as information from land management agencies.

This project would traverse both the Wyoming Basin and the Colorado Plateau geographic regions. The soils of the Wyoming Basin region formed in material derived from sedimentary rocks, and have often been modified by wind and water. Soil development ranges from little horizon differentiation on surfaces of recent age, to soils with well developed subsoils or accumulations of calcium carbonate. Some soils are saline and/or alkaline. Surface organic matter content is low in most of these soils. Desert pavements may be common. Soil fertility is mostly low.

The soils in the Colorado Plateau region formed in material derived from sedimentary and volcanic rocks, and have often been modified by wind and water. Soil development ranges from little horizon differentiation on surfaces of recent age, to soils with well developed subsoils on stable plain and plateau surfaces. Surface organic matter content is low in warm arid environments of lower elevations, and moderate to high on cool and moist plateaus and mountains. Desert pavements may be common. Soil fertility is mostly low.

Muddy Creek Loop. The loop would lie within the Wyoming Basin geographic region and would traverse very shallow to very deep, well-drained to excessively drained, sands, clay loam, sandy clay loam, and gravelly sandy loam soils which occur on undulating to hilly upland plains, erosional uplands, alluvial fans, and alluvial bottomlands. The soils also include areas of sand dunes and badlands. Slope gradients range from 0 to 40 percent but are mostly 5 to 15 percent. Water erosion potential is mostly low but ranges from low to high and wind erosion potential is mostly moderate. Reclamation potential ranges from poor to fair, but is predominantly poor due to shallow topsoil resources and high salinity [SCS, 1985b; 1985c].

Green River Loop. The loop would lie within the Wyoming Basin geographic region and would traverse a wide variety of soils. The soils are primarily moderately deep to very deep, well-drained, sandy loams to sandy clay loams. Some soils are shallow gravelly clay loams. Badlands and areas of rock outcrops are also common.

The predominant landforms include alluvial fans and plains, undulating plains, residual uplands, and badlands. Slope gradients range from 0 to 40 percent but are mostly 5 to 10 percent. Water erosion potential ranges from low to high but is predominantly low. Wind erosion potential ranges from low to high but is predominantly moderate. Reclamation potential ranges from poor to fair but is predominantly poor due to erosion, quantity of topsoil, high salinity, and low available moisture [SCS, 1985b; 1985c; 1986h].

~~Vernal Station. The existing station is located within the Uinta Basin portion of the Colorado Plateau geographic region. The soils at the station are shallow, well drained, clay loams to sandy loams on undulating to rolling slopes. Slope gradient varies from 5 to 20 percent. Water and wind erosion potentials are moderate. Reclamation potential is poor due to shallow topsoil resources [Wilson et al., 1975].~~

Rangely Loop A. This loop would lie within a somewhat mountainous portion of the Colorado Plateau geographic region and would traverse very shallow to deep, well-drained, fine sandy loam, stony clay loam, and channery loam soils. Predominant landforms include alluvial valley floors and low terraces along Douglas Creek, and sideslopes, fans, and foothills. Slope gradients range from 0 to 90 percent but are mostly 0 to 20 percent. Water erosion potential ranges from low to high but is mostly moderate. Wind erosion potential ranges from low to moderate but is mostly low. The steep canyon slopes adjacent to the valley bottom and the vertical cut banks along Douglas Creek and West Douglas Creek are very prone to mass failure.
Reclamation potential ranges from poor to good, but is mostly poor. Major limitations to successful reclamation include steep slopes, shallow topsoil, high coarse fragment content, high salinity, and severe water erosion. Some of the soils on the alluvial terraces and valley floors support haylands and pasture [SCS, 1982b; 1986b].

Rangely Loop B. The loop would lie within a somewhat mountainous portion of the Colorado Plateau geographic region and would traverse shallow to very deep, generally well drained, fine sandy loam, clay loam and silty clay loam soils on alluvial valley bottoms, terraces and fans along East Salt Creek, and uplands, hillslopes, and badlands. Slope gradients range from 0 to 65 percent but are mostly between 0 and 20 percent. Water erosion potential ranges from low to high but is predominantly low to moderate. Wind erosion potential ranges from low to moderate, but is mostly moderate. The steep canyon sideslopes adjacent to the valley bottom have experienced large areas of mass failure. Reclamation potential ranges from poor to good but is mostly good. The predominant limitations to successful reclamation include high salinity, shallow topsoil resources, and water erosion. The loop would traverse several farmland areas consisting primarily of hayland and pasture [SCS, 1978a; 1982b; 1986b].

Cisco Loop and Cisco Compressor Station. The loop and the Cisco Compressor Station would lie within the Colorado Plateau geographic region and would traverse very shallow to very deep, well-drained, silt loam, sandy loam, clay loam, and gravelly loam soils on dissected pediments, ridges, broad plains, along drainage ways and valley flats, and on badlands. Slope gradients range from 0 to 50 percent but are predominantly 5 to 15 percent. The steeper slopes occur on badland areas. Water erosion hazard ranges from low to high, but is mostly low. Wind erosion potential ranges from low to moderate but is mostly moderate. Reclamation potential is predominantly poor with major limitations to successful reclamation including shallow soils, high salinity, and low available moisture [SCS, 1986c].

Moab Loop. The loop would lie within the Colorado Plateau geographic region in an area with numerous sandstone rock outcroppings. The loop would traverse predominantly sandy soils including fine sandy loams, fine sands, and gravelly fine sandy loams. These soils are well-drained and are very shallow to very deep but are mostly deep. Predominant landforms include terraces, canyon floors, cuestas, benches, mesas, escarpments, and pediments. Slope gradient ranges from 1 to 60 percent but is predominantly 2 to 20 percent. Water and wind erosion potentials are mostly low to moderate. Reclamation potential ranges from poor to good but is mostly poor. Major limitations to successful reclamation include low available water, erosion, shallow topsoil, and high salinity [SCS, 1986c].

Cahone Loop and Cahone Compressor Station. This loop and compressor station would lie within the Colorado Plateau geographic region and would traverse very shallow to deep, but mostly deep, well drained, loam, clay loam, fine sandy loam, and cobbly sandy clay loam soils. Predominant landforms include hillsides, fans, terraces, mesas, and rock outcrops. Slope gradients range from 0 to 80 percent but are mostly 3 to 10 percent. Water erosion potential ranges from low to high but is mostly low. Wind erosion potential ranges from low to moderate but is mostly moderate. Reclamation potential ranges from poor to good, but is mostly fair. Major limitations to successful reclamation include erosion, low available moisture, and high coarse fragment content. Much of the loop would traverse agricultural lands [SCS, 1986a].

3.6.3.4 Surface Water

The expansion project would traverse two major USGS-designated river basins, the Green River and the Colorado River basins. The Green River is the major tributary to the Colorado River. The majority of the project lies in a semiarid region where average annual precipitation ranges from 7 to 15 inches, and up to 25 inches along the mountainous portion of the project route. Potential evapotranspiration exceeds precipitation in this region, and consequently the frequency of perennially flowing streams is quite low. These conditions in combination with the predominance of sedimentary rock cause most surface water resources to be moderately to highly alkaline or saline.

Both rainfall and snowfall contribute significantly to total annual precipitation. Generally, perennial and intermittent streamflow occurs primarily in response to snowmelt and baseflow inflow with some peakflows generated by intense thunderstorm events. The quality of perennial flow is generally much better than for intermittent and ephemeral flows which are characteristically alkaline. The numerous ephemeral streams flow primarily in response to high intensity thunderstorms. These flows transport sediment at their carrying capacities and consequently are very turbid. Table 3.6-27 summarizes the streams that would be crossed by the project as well as the sensitivity of the streams to pipeline construction. Sensitivity is based on the gradient of the channel bed.

3.6.3.5 Groundwater

Existing groundwater conditions along the Northwest Pipeline Expansion Project are summarized in Table 3.6-28. A locally high water table may exist along major intermittent and perennial streams. See Section 3.6.3.4 for a description of streams which may have saturated alluvium associated. Groundwater quality near the proposed loops varies from good to poor. However, groundwater development is low due to the low population density. Groundwater flow is a significant contributing factor to slope instability along the Rangely A and B loops.

3.6.3.6 Freshwater Biology

Relatively few perennial streams would be crossed by any loops of the Northwest Expansion. The streams which would be affected are listed in Table 3.6-29. No significant game fish populations or sensitive species occur in streams near the route. Intermittent and ephemeral streams along the pipeline provide some habitat for

Table 3.6-27

MAJOR DRAINAGE CHANNELS, NORTHWEST EXPANSION PROJECT

				Sensitivity2/		
Loop	Drainage Basin	Drainage Channel	Flow1/ Class	Side-Slope	Channel Bed	Mile-post
Muddy Creek	Green River	Robertson Creek	I	-	-	432.5
		Dry Muddy Creek	I	-	-	424.0
		Blacks Fork	P	L	L	420.9
		Porter Hollow	I	-	-	418.4
		Meadow Springs Wash	I	-	-	407.3
		Chicken Draw	I	-	-	405.1
Green River		Halfway Hollow	I	-	-	390.7
		Buckboard Wash	I	-	-	387.7
		Buckboard Wash	I	-	-	387.4
Rangley Loop A	Colorado River	Big Horse Draw	I	-	-	273.7
		No Name Draw	I	-	-	273.0
		Douglas Creek	P	L	M	271.3
		East Fourmile Draw	I	-	-	270.2
		Black Cedar Draw	I	-	-	269.0
		State Bridge Draw	I	-	-	267.2
		Vandamore Draw	I	-	-	266.1
		Douglas Creek	P	L	M	265.0
		Little Bull Draw	I	-	-	264.2
		Little Indian Draw	I	-	-	261.6
		Little Horse Draw	I	-	-	260.4
		W. Douglas Creek	P	L	H	259.7
		W. Douglas Creek	P	L	H	258.5
		W. Douglas Creek	P	L	H	257.9
		W. Douglas Creek	P	L	H	257.1
		W. Douglas Creek	P	L	H	256.5
		Rope Canyon	I	-	-	254.5
		Red Rock Canyon	I	-	-	251.9
Rangley Loop B		Compton Canyon	I	-	-	239.8
		Trail Canyon	I	-	-	235.7
		Ashford Canyon	I	-	-	234.6
		Spink Canyon	I	-	-	233.0

Table 3.6-27 (continued)

MAJOR DRAINAGE CHANNELS, NORTHWEST EXPANSION PROJECT

Loop	Drainage Basin	Drainage Channel	Flow[1] Class	Sensitivity[2] Side-Slope	Channel Bed	Mile-post
Rangley Loop B (cont.)	Colorado River	East Salt Creek	P	L	H	230.5
		East Salt Creek	P	L	H	230.3
		Howard Canyon	I	-	-	228.0
		Demaree Canyon	I	-	-	226.4
Cisco		Danish Wash	I	-	-	190.1
		Cisco Wash	I	L	L	186.4
		Nash Wash	I	-	-	182.1
		Pinto Wash	I	-	-	180.8
		Sagers Wash	I	-	-	178.8
		Cottonwood Wash	I	-	-	174.3
Moab		Kane Springs	P	-	-	131.8
		Muleshoe Canyon	I	-	-	131.0
		West Coyote Creek	I	-	-	126.1
		Joe Wilson Canyon	I	-	-	121.7
		Hook and Ladder Gulch	I	-	-	119.6
		Lopez Gulch	I	-	-	117.9
		Sandstone Draw	I	-	-	116.0
		Big Indian Wash	I	-	-	114.2
Cahone		Sandstone Canyon	I	-	-	62.2
		Yellow Jacket Canyon	I	-	-	58.0
		Brumley Draw	P	M	M	56.4
		U Lateral Canal	I	-	-	54.6
		Lone Pine Lateral	I	-	-	53.6
		Lone Pine Lateral	I	-	-	53.4
		Lone Pine Lateral	I	-	-	53.2
		Moonlight Lateral Canal	I	-	-	52.8

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[1] I = intermittent; P = perennial; - = ditch or canal, artificial flow

[2] Channel Bed Gradient: L = low 0-1% M = moderate 1-3% H = high >3%
Sideslope (topographic slope): L = low 0-5% M = moderate, 5-20%
H = high > 20%

Table 3.6-28

GENERAL GROUNDWATER CHARACTERISTICS, NORTHWEST EXPANSION PROJECT

Pipeline Miles	Minimum Depth to Water (ft)	Total Dissolved Solids Concentration (mg/l)	Degree of Groundwater Development	References	Comments
Muddy Creek Loop [MP 437.7-402.7]	<10	<1000	low	Welder [1968] Iorns et al. [1964]	no major springs
Green River Loop [MP 391.7-387.6]	wells deeper than 2200 ft. are flowing	1500	low	Welder [1968]; Iorns et al.[1964]	no major springs
Vernal Station [MP 329.8]	unknown	4000	low	Iorns et al. [1964]	no major springs
Rangely Loop A [MP 277.7-246.9]	20	200-4800	low	U.S.G.S. Water-Supply Paper 2275 [1985]	Sand Spring MP172.9
Rangely Loop B [MP 239.9-223.7]	20	200-4800	low	U.S.G.S. Water-Supply Paper 2275 [1985]	no major springs
Cisco Loop [MP 195.6-169.9]	300	300-7000	low	Feltis [1966]	no major springs
Moab Loop [MP 145.6-110.8]	700	<1000	low	Feltis [1966]	no major springs
Cahone Loop [MP 67.9-51.6]	<20	200-3000	low	Whitfield et al. [1983]	no major springs

Table 3.6-29

FISHERY VALUE OF PERMANENT STREAMS, NORTHWEST EXPANSION PROJECT

Loop	Milepost	State	County	Stream	Fisheries [1]	B/W [2] Classification
Muddy Creek	420.9	Wyoming	Lincoln	Black's Fork	NG	C
Green River	No permanent streams					
Rangley A	271.3	Colorado	Rio Blanco	Douglas Creek	NG	U
	257.9	Colorado	Garfield	West Douglas Creek	NF	U
Rangley B	230.5	Colorado	Garfield	East Salt Creek	NG	D
	202.6	Colorado	Garfield	East Salt Creek	NG	D
Cisco	186.4	Utah	Grand	Cisco Wash	NF	U
Moab	131.8	Utah	San Juan	Kane Springs	NF	U
Cahone	56.4	Colorado	Montezuma	Brumley Draw	NF	U

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[1] NG - Nongame
G - Game
NF - No fisheries

[2] BIO/WEST stream classification data:

Class -	Criteria
A	Stream area containing an excellent game fishery and/or federally listed endangered species. These streams are typically the most highly rated streams in state classifications.
B	Stream area containing a high quality game fishery and/or candidate species for federal endangered species status or state sensitive species. These streams are important since they normally support the bulk of fishing use within a given state.
C	Stream areas exhibiting a limited or moderate game fishery. Fishing in these waters is considered a secondary use.
D	Stream areas with few or no game fish, primarily inhabited by nongame fish. These areas are of no practical value as a fishery resource.
U	Stream areas with no fishery resource, or streams which have not been classified due to lack of information. Usually very small perennial or intermittent streams.

organisms with short life cycles which are capable of exploiting temporary environments. These organisms would include various algae, insects, and crustaceans.

Except for the Muddy Creek Loop, no federal or state species of concern occur in streams crossed by these loops.

Muddy Creek Loop. Blacks Fork would be the only major drainage crossed by the Muddy Creek Loop. Cutthroat, brown, rainbow, and brook trout occur upstream of the expansion. However, primarily nongame species occur in the river in the vicinity of the crossing. These species include Utah chub, roundtail chub, speckled dace, fathead minnow, white sucker, flannelmouth sucker, mountain sucker and mottled sculpin [Richards and Holden, 1981].

Species of special concern, including the flannelmouth sucker and roundtail chub, are not widely distributed in Wyoming and are thus considered uncommon. However, these species are abundant in other areas, particularly the Colorado River Drainage [Baxter and Simon, 1970].

Green River Loop. No perennial streams with substantial aquatic resources would be crossed by the loop.

Rangely Loop A. Douglas Creek and West Douglas Creek would be the only perennial streams crossed by the Rangely Loop A. The loop would also parallel Douglas Creek and cross a number of its intermittent tributaries. No fisheries occur in either Douglas or West Douglas Creeks [Hollowed, 1986].

Rangely Loop B. East Salt Creek is the only perennial stream which would be crossed by the Rangely Loop B. East Salt Creek supports, at best, a limited nongame fishery along most of its length. An occasional trout may be found in the stream above Trail Canyon [Lambeth, 1986].

Cisco Loop. ~~One~~ Two intermittent streams, Cisco Wash and Cottonwood Wash, would be crossed by the Cisco Loop. No fisheries ~~or other aquatic resources~~ are known to occur in ~~this~~ these streams, and macroinvertebrates are limited in numbers and diversity [Dalton, 1986].

Moab Loop. ~~No permanent streams or other aquatic resources would be crossed by the Moab Loop.~~ One perennial stream, Kane Springs, would be crossed by the loop. No fisheries or substantial aquatic resources occur in this stream.

Cahone Loop. One perennial stream, Brumley Draw, would be crossed by the Cahone Loop. No fisheries are known to exist within this stream [Button, 1986]. Narraguinnep Reservoir is also located near the pipeline and several of its intermittent tributaries would be crossed by the Cahone Loop. The reservoir supports warm and cold water fisheries dominated primarily by walleye, perch and stocked rainbow trout [Button, 1986].

3.6.3.7 Terrestrial Biology

3.6.3.7.1 Vegetation

The Northwest Expansion Project would traverse the Wyoming Basin and Colorado Plateau geographic regions. Approximately six distinct vegetation community types would be crossed including mixed desert shrub, greasewood, pinyon-juniper woodland, agricultural land, sagebrush scrub, and wetland/riparian vegetation. The wetland/riparian vegetation is distributed in narrow bands along numerous intermittent and perennial streams which are generally not feasible to resolve at this level. The distribution of these vegetation types along the project as determined from aerial observation and field survey is presented in Table 3.6-30.

Several rare plants occur in the area traversed by Rangely Loop B, Cisco, Moab, and Cahone Loops. No rare plants occur on the other loops. These rare plants include federally listed and candidate species. ~~for listing.~~ Appendix C lists the plant species that are of concern, their status, required habitat, and their general occurrence along the route. The list includes those species itemized by the U.S. Fish and Wildlife Service that staff determined to have a reasonable potential of occurring in the vicinity of the pipeline routes, as well as additional species believed to have a potential of occurring. Table 3.6-31 lists the plant species which are legally protected by federal law which have the greatest potential of occurring along the loops. Surveys were conducted for these species by qualified field botanists during June-July 1986 along the proposed pipeline routes. The results of the survey are presented in the Environmental Consequences chapter.

Muddy Creek Loop. The Muddy Creek loop would traverse mixed desert shrub all within the Wyoming Basin geographic region. Wetland/riparian vegetation (wet meadow) occurs where the route would cross Blacks Fork as well as a small number of intermittent streams. No plant species of special concern are known to occur along this loop.

Green River Loop. The loop would traverse mixed desert shrub along its total length within the Wyoming Basin geographic region. No plant species of special concern are known to occur along this loop.

~~Vernal Station. The existing station occurs in mixed desert shrub within the Uinta Basin portion of the Colorado Plateau. No plant species of concern are known to occur at this location.~~

Rangely Loop A. This loop would lie within the Colorado Plateau geographic region and would traverse mixed desert shrub, greasewood, pinyon-juniper woodland, agricultural land, and sagebrush scrub types. The loop would parallel and cross numerous perennial streams including Douglas and West Douglas

Table 3.6-30

VEGETATION COMMUNITY TYPES, NORTHWEST EXPANSION PROJECT

Loop	Geographic Region	Vegetation Type	Milepost
Muddy Creek	Wyoming Basin	Mixed Desert Shrub	437.3-402.8
Green River	Wyoming Basin	Mixed Desert Shrub	391.7-387.6
Vernal Substation	Colorado Plateau	Mixed Desert Shrub	329.8
Rangely A	Colorado Plateau	Mixed Desert Shrub	277.7-273.5
		Greasewood	273.5-272.5
		Mixed Desert Shrub	272.5-271.3
		Greasewood	271.3-266.0
		Pinyon-Juniper Woodland	266.0-264.9
		Greasewood	264.9-263.9
		Pinyon-Juniper Woodland	263.9-252.6
		Agricultural land	252.6-251.7
		Greasewood	251.7-249.6
		Sagebrush scrub	249.6-247.7
		Agricultural land	247.7-246.9
Rangely B	Colorado Plateau	Sagebrush scrub	239.9-235.8
		Pinyon-Juniper Woodland	235.8-234.7
		Agricultural land	234.7-232.9
		Greasewood	232.9-230.7
		Agricultural land	230.7-228.7
		Greasewood	
		Pinyon-Juniper Woodland	228.7-227.8
		Greasewood	227.8-225.6
		Mixed Desert Shrub	225.6-224.7
		Greasewood	224.7-223.9
		Mixed Desert Shrub	223.9-223.7
Cisco	Colorado Plateau	Mixed Desert Shrub	195.6-179.5
		Wetland/riparian	179.5-179.3
		Mixed Desert Shrub 1/	179.3-169.9

Table 3.6-30 (continued)

VEGETATION COMMUNITY TYPES, NORTHWEST EXPANSION PROJECT

Loop	Geographic Region	Vegetation Type	Milepost
Moab	Colorado Plateau	Mixed Desert Shrub	145.6-136.5
		Pinyon-Juniper Woodland	136.5-127.6
		Sagebrush scrub	127.6-124.3
		Pinyon-Juniper Woodland	124.3-122.5
		Mixed Desert Shrub	122.5-119.2
		Greasewood	119.2-118.4
		Mixed Desert Shrub	118.4-116.6
		Greasewood	116.6-115.7
		Mixed Desert Shrub	115.7-114.5
		Greasewood	114.5-113.7
		Mixed Desert Shrub	113.7-111.4
		Pinyon-Juniper Woodland	111.4-110.8
Cahone Loop	Colorado Plateau	Agricultural land 2/	67.9-51.6

1/ With Pinyon-Juniper woodland in some places.

2/ Sagebrush scrub and Pinyon-Juniper Woodland occurs sporadically along the expansion within this type.

Table 3.6-31

LEGALLY PROTECTED PLANT SPECIES, NORTHWEST EXPANSION PROJECT

Species	Status 1/	Loop
Uinta basin hookless cactus	LT	Rangely B
Jones cycladenia	LT	Cisco
Spineless hedgehog cactus	LE	Moab
Spreading wild buckwheat	PE	Cahone

1/ Status: LT - federally listed threatened, PE - federally proposed endangered, LE - federally listed endangered.

Creeks, along most of the route where small areas of wetland/riparian vegetation occur. The agricultural land primarily includes hayland and pasture. No plant species of special concern are known to occur along this loop.

Rangely Loop B. The loop would traverse sagebrush scrub, pinyon-juniper woodland, agricultural land, greasewood, and mixed desert shrub within the Colorado Plateau region. Most of the route parallels a perennial stream, East Salt Creek, where wetland/riparian vegetation occurs. The cropland primarily includes hayland and pasture.

The loop would traverse areas which may support individuals and habitat of several plant species of concern. These include a federally listed threatened species, the Uinta Basin hookless cactus, two candidate C3c species, and one state of Colorado sensitive species concern as itemized in Appendix C. The Uinta Basin hookless cactus may occur along the southern portion of the loop in mixed desert shrub on gravelly to rocky hills, mesas, terraces, and slopes.

Cisco Loop. The loop would traverse mixed desert shrub, and wetland/riparian vegetation within the Colorado Plateau region. The wetland/riparian vegetation occurs primarily along Nash, Pinto, and Sagers Washes.

The loop would traverse areas which may support individuals or potential habitat of a federally listed threatened species, Jones cycladenia, one candidate 2, and one candidate C3c species. The Jones cycladenia may grow in areas along the southern portions of this loop in sparsely vegetated mixed desert shrub on badland hills.

Moab Loop. The loop would traverse mixed desert shrub, pinyon-juniper woodland, sagebrush scrub, and greasewood types within the Colorado Plateau geographic region. Also included are narrow zones of wetland/riparian vegetation along drainages in the mixed desert shrub.

One federally listed endangered species, spineless hedgehog cactus, and a candidate C3c species may occur in areas along the loop route where the Morrison Formation is exposed.

Cahone Loop. The loop would primarily traverse agricultural land with small inclusions of sagebrush scrub, pinyon-juniper woodland, and wetland/riparian vegetation within the Colorado Plateau geographic region.

A federally proposed endangered species, spreading wild buckwheat, may occur in areas along the southern portion of the route where Mancos shale outcrops.

3.6.3.7.2 Wildlife

Diverse plant communities, topography and spatial distribution of the loop expansions of the Northwest pipeline provide habitat for a variety of wildlife species. Specific habitat types are generally utilized by characteristic fauna. Most of the component species within these groups are widely distributed in the western United States and occur discontinuously along the segments where their appropriate habitat exists. Common species for the vegetation communities encountered along the alignment are discussed under the individual loops below.

Wildlife species of high interest to appropriate state and/or federal agencies are also presented under the individual loops. These species include game animals, raptors and other vertebrates that may be limited in distribution within the region. Map 3 in Volume IV depicts important or critical habitat for these species along the loops.

Table 3.6-32 lists species of special concern, their status, associated habitats and proposed loop on which they may occur. Specific milepost locations have been excluded to avoid harassment of sensitive species and their habitats.

Presence and distribution of wildlife species and habitats have been delineated based on published literature, the data files of federal and state agencies, and on-site surveys conducted by BIO/WEST, Inc. during August 1986 for species of special concern.

Muddy Creek Loop. This loop traverses the mixed desert shrub community type. As a result, the vertebrate diversity along the alignment is relatively limited, although the presence of cliffs and rock outcrops do provide additional specialized habitat that increases the variety of wildlife encountered.

Common species associated with the mixed desert shrub community include the northern side-blotched lizard, desert short-horned lizard, northern sagebrush lizard, gopher snake, horned lark, rock wren, sage thrasher, sage sparrow, Brewer's sparrow, white-tailed prairie dog, badger, coyote, and pronghorn antelope [BLM, 1978].

The golden eagle, prairie falcon, and burrowing owl are species of high state interest [Ritter, 1986]. Potential nesting habitat for golden eagles and prairie falcons occurs along cliff faces and rock outcrops that are limited and sporadically distributed along the loop. No nests have been identified within one half mile of the alignment. Burrowing owls prefer prairie dog colonies for nesting habitat [BLM, 1985a]. Although no burrowing owl nests have been delineated for the area of concern, an on-site survey identified approximately 1,300 acres of prairie dog towns within one half mile of the alignment indicating a high potential for the occurrence of such nests.

Table 3.6-32

WILDLIFE SPECIES OF SPECIAL CONCERN, NORTHWEST EXPANSION PROJECT

Species	Status 1/	Habitat	Loops
Bald Eagle	E	Permanent waterways and migration corridors	Muddy Creek
Peregrine falcon	E	Cliff faces for nesting; all types for hunting	Muddy Creek Rangley A Rangley B Moab
Black-footed ferret	E	Grasslands, shrublands with viable prairie dog colonies	Muddy Creek Green River Rangley B Cisco Moab Cahone
Whopping Crane	E	Permanent waterways and migration corridors	Muddy Creek
Ferruginous hawk	C2	Open grasslands	Muddy Creek Green River ~~Vernal-Substation~~ Rangley B Cisco Moab
Swainson's hawk	C2	Grasslands and open woodlands	Muddy Creek Green River ~~Vernal-Substation~~ Rangley B Cisco Moab

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1/ Status: E = federally endangered; C2 = federal candidate, category 2

Important game species in the vicinity of the alignment are limited to sage grouse and pronghorn antelope. Only one active lek has been identified within the area of concern [WGF, unpublished data]. This sage grouse breeding ground is more than one mile from the proposed loop. Pronghorn are widely distributed throughout the region, and approximately 17 miles of critical winter range occur on or adjacent to the loop [BLM, unpublished data f].

The bald eagle and peregrine falcon, both federally listed endangered species, may occur in the general vicinity of the pipeline. Bald eagles winter in the general region [BLM, 1985a], but no known concentration sites have been identified in the area of concern [BLM, unpublished data f]. Peregrine falcons may occur in the area, but there are no known nests and only rare unconfirmed sightings [BLM, 1985a]. The few areas of cliffs and rock outcrops within the area of concern may provide potential nest sites. Whooping cranes, also federally endangered, have been sighted in Southwest Wyoming on their spring and fall migrations. Sightings have been reported on Black's Fork River [Taylor, 1986], but specific reaches were not identified. Black-footed ferrets, also federally endangered, are strongly associated with prairie dog colonies [USFWS, 1986], and as such, all prairie dog colonies are considered potential ferret habitat [Linder, 1970]. As mentioned above, approximately 1,300 acres of active prairie dog towns have been delineated within one-half mile of the alignment and the potential exists for other colonies along the entire loop. At present there is no evidence of ferret activity within the area of concern.

Ferruginous and Swainson's hawks, both federal candidates for listing, are known to nest within the general region [BLM, 1985a]. No known nests have been delineated for the analysis corridor. [BLM, unpublished data f].

Green River Loop. This loop would traverse only the mixed desert shrub community. Characteristic species for this habitat type have been described under the Muddy Creek Loop. No specialized habitat occurs within one-half mile of the alignment.

The alignment traverses summer/year-long pronghorn range, but does not cross any critical range [BLM, unpublished data e.]. Potential habitat exists for sage grouse, but no breeding/nesting areas have been identified in the vicinity of the loop [BLM, unpublished data e; WGF, unpublished data].

Only one federally listed species potentially occurs along this alignment: the black-footed ferret. The physiography and plant community along the entire loop provide appropriate habitat for prairie dog colonies, the prime component of ferret habitat. No prairie dog towns have been identified within the area of concern [BLM, unpublished data e and f].

Ferruginous and Swainson's hawks, candidates for federal listing, are known to nest in the region [BLM, 1985a]. No nests have been identified within one-half mile of the pipeline [Hammond, 1986].

~~Vernal Station. The vegetation community associated with the Vernal Station is mixed desert shrub. Characteristic fauna were described previously under Muddy Creek Loop.~~

~~No federally listed or candidate species have been identified within the immediate vicinity of the Vernal Station [Perchon, 1986]. No prairie dog colonies were observed during an initial reconnaissance in July 1986. Potential nesting habitat does exist for ferruginous and Swainson's hawks but no specific nests have been delineated within the area of concern.~~

Rangely Loop A. This loop follows the floor of Douglas Creek Canyon towards Douglas Creek Pass. The rock outcrops and cliffs of the canyon sides provide specialized wildlife habitat. The five vegetation community types occurring along the alignment provide an array of habitats for many forms of wildlife.

Because three of the vegetation communities (desert shrub, sagebrush and greasewood) are of similar growth form and have overlapping plant composition, the general fauna are of similar composition. Typical species include the side-blotched lizard, sagebrush lizard, northern plateau lizard, western garter snake, black-billed magpie, western meadowlark, Brewer's sparrow, rock wren, least chipmunk, white-tailed jackrabbit, long-tailed weasel, badger, and mule deer [Armstrong, 1972; Stebbins, 1966; BLM, unpublished data d]. Typical species in the pinyon-juniper woodland are the western whiptail, western fence lizard, gopher snake, mourning dove, blue-gray gnatcatcher, mountain chickadee, common flicker, long-eared myotis, pinyon mouse, golden mantled ground squirrel, bobcat, and mule deer [Armstrong, 1972; Stebbins, 1966; BLM, unpublished data d]. Typical agricultural land species include the ring-necked pheasant, rock dove, brown-headed cowbird, barn swallow, black-billed magpie, western meadowlark, big brown bat, deer mouse, and striped skunk [Armstrong, 1972; Stebbins, 1966; BLM, unpublished data d].

The rock outcrops, cliffs, and adjacent coniferous vegetation provide habitat for nesting raptors. Three golden eagle and two red-tailed hawk nests occur within one-half mile of the alignment [BLM, unpublished data i]. One adult prairie falcon was observed during an initial reconnaissance in July 1986 indicating potential nesting in the vicinity.

Mule deer and elk winter ranges occur throughout the area of concern. The loop would traverse approximately two miles of mule deer ~~severe~~ winter range and 31 miles of elk ~~severe~~ winter range [BLM, unpublished data i].

The cliff faces and steep, rugged terrain provide potential nesting habitat for peregrine falcons along approximately 11 miles of the proposed loop. No nest sites have been recorded [BLM, unpublished data i].

Rangely Loop B. The five vegetation communities and the physiographic relief of this loop are the same as Rangely Loop A. As such, the characteristic fauna are the same and are described under Rangely Loop A.

The rugged physiographic relief provides ample raptor nesting habitat for golden eagles and prairie falcons. One golden eagle nest has been identified within one half-mile of the alignment BLM, unpublished data d].

Mule deer and elk ranges occur throughout the immediate region. The route crosses or is adjacent to 14 miles of mule deer severe winter range and four miles of elk severe winter range [BLM, unpublished data d]

Cliff faces provide potential for peregrine falcon nesting along approximately 11 miles of this loop; however, no nests have been identified within the area of concern [BLM, unpublished data d.]. Although there is no evidence of black-footed ferret occurrence in the area, approximately 550 acres of prairie dog colonies have been identified within one-half mile ~~of the latter five mile segment~~ of this alignment during an on-site survey in August 1986. This ~~latter portion~~ alignment also provides potential nest sites for ferruginous and Swainson's hawks. At present, no nests have been identified within the area of concern [BLM, unpublished data d.].

Cisco Loop. The monotypic vegetation community (mixed desert shrub) and the paucity of special habitat features restrict the wildlife diversity along this loop. A limited zone of tamarisk scrub riparian habitat provides structure and habitat for nesting passerines. Characteristic species of the mixed desert shrub community have been previously described under Muddy Creek Loop.

Approximately 60 percent of the terrain along the route is prime prairie dog habitat, and more than 6,500 acres of prairie dog colonies have been identified within one-half mile of the route [BLM, unpublished data c]. Several ferret sightings have been made for this general region over the past several years, but a 1985 survey failed to substantiate these observations [Moretti, 1986]. Ferruginous and Swainson's hawks are known to nest in the general area. One ferruginous hawk nest has been identified within one-half mile of the alignment [UDWR, unpublished data a], and there is a high probability that other viable nests do exist [Dalton, 1986].

Moab Loop. This loop would traverse four vegetation communities. Steep cliffs and rock outcrops in the immediate vicinity of the route provide additional specialized habitat. The vegetation communities are sagebrush, greasewood, mixed desert shrub and juniper-pinyon woodland. Characteristic faunal associations were previously described under Rangely Loop A.

Year-long antelope range, including fawning areas, occurs throughout most of the area of concern [UDWR, unpublished data a; Dalton, 1986]. In addition, critical mule deer winter range exists over approximately ten miles of the alignment [BLM, unpublished data c]. The Hopi rattlesnake, a species with limited distribution and a concern of the Utah Division of Wildlife Resources [Dalton, 1986], is relatively abundant over much of the area of concern. Nine winter dens occur in the vicinity of the alignment [Dalton, 1986].

Historical distribution patterns and present vegetation communities indicate the potential for prairie dog colonies over two portions of the alignment. One colony has been identified within the area of concern by an on-site investigation. This is an isolated colony of approximately 200 acres, and is unlikely to support black-footed ferrets. The many cliff faces in the area provide ample nesting habitat for peregrine falcons. One aeyrie has been identified within approximately one mile of the alignment [BLM, unpublished data c]. All of the immediate area traversed by the loop is utilized by wintering peregrines [Dalton, 1986].

Potential nesting habitat exists for ferruginous and Swainson's hawks along the entire length of the alignment, although no nests have been currently identified within 0.5 mile of the alignment [UDWR, unpublished data a].

Cahone Loop. This alignment traverses agricultural lands dotted with limited pinyon juniper woodland. Characteristic wildlife species have been previously described under Rangely Loop A. Mule deer utilize the general area during migration, but no major migration corridors exist within the area of concern [Button, 1986].

The loop falls within the historical distribution of prairie dogs and black-footed ferrets. Prairie dog colonies may be present within the area of concern, but due to the extensive cultivation of this area, the likelihood is minimal. No viable colonies have currently been identified in the vicinity of the loop [Button, 1986]. The general area may be utilized by hunting peregrines. ~~although the closest known aeyrie is approximately 15 miles from the alignment [Button, 1986].~~

The scattered pinyon-juniper woodland may provide potential nesting habitat for Swainson's hawks. No nests have been identified within the area of concern.

3.6.3.7.3 Grazing

The Northwest pipeline would traverse a variety of established grazing allotments as well as lands used primarily for grazing under federal, state and private ownership. A narrative briefly describes the allotments found along the route. More detailed information for each federal allotment is found in Appendix D. Because grazing records are often not ownership specific for state and private lands, detailed information is lacking for those types of ownership.

Muddy Creek Loop. The alignment would traverse two BLM cattle and sheep allotments [BLM, 1985]: the Carter and Granger leases which are 118,114 and 248,107 acres, respectively. Both allotments are used during December through April for sheep and May through October for cattle. About 9 to 15 acres are required per AUM for the allotments. Adjoining private and state lands are also used for grazing.

Green River Loop. The project would traverse two BLM grazing allotments: the Granger lease and Henry's Fork Pasture E [Murphy, 1986]. Both graze sheep during November through April and cattle during May through October. About 11 to 15 acres are required per AUM. The Henry's Fork Pasture E allotment is completely fenced. Fences and livestock guards are used on both allotments to maintain separation and control. Adjoining private and state lands are also used for grazing.

~~Vernal Station.--This area is not grazed.~~

Rangely Loop A. Six BLM allotments would be traversed by the alignment [Smith, 1986]. Five allotments graze cattle, mostly during the winter, and one grazes sheep during winter and spring. Sizes vary from about 5,500 to 134,600 acres. Quality varies from about 12 to over 52 acres required per AUM. Control and separation is maintained by using herders with dogs as well as fences and livestock guards.

Rangely Loop B. Portions of three BLM cattle allotments ranging from about 4,600 to 94,000 acres would be traversed by the project [BLM unpublished data, 1986]. Quality varies from 8.3 to 17 acres required per AUM.

Cisco Loop. Two sheep, one cattle, and one sheep/cattle allotment would be traversed by the project. All but one are used during the fall through spring period. The exception is the Agate sheep allotment that is used during mid-February through mid-May. All of the allotments are reported [BLM,1983] as being in unsatisfactory condition.

Moab Loop. Five cattle and one sheep allotment would be crossed by the project [BLM, 1983]. Sizes range from about 4,000 to 120,800 acres. All of the allotments are grazed during late fall through spring. Quality varies considerably among the allotments. The highest quality allotment in this loop, Monticello Cowboy, requires only 4.9 acres per AUM compared to the Kane Springs allotment which requires nearly 57 acres per AUM. All but the Monticello Cowboy allotment were reported as in unsatisfactory condition [BLM 1983]. An additional state/private allotment is adjacent to the above noted allotments but no detailed information was available for the unit.

Cahone Loop. ~~No-federal-allotments-were-noted-within-this-loop.~~ Most of the land is privately owned, ~~although~~ with some of them ~~private-lands-are-agricultural--lands~~ being used for agriculture. Some of the agricultural lands are grazed on an irregular basis. Approximately 3/4 of a mile of the Cahone Loop crosses San Juan National Forest Lands.

3.6.3.8 Socioeconomics

3.6.3.8.1 Population, Housing, and Economic Characteristics

The Northwest Expansion component of the El Paso project could potentially affect two counties in Wyoming, two counties in Utah, and six counties in Colorado.

Colorado Counties. La Plata, Dolores, Garfield, Montezuma, Mesa, and Rio Blanco counties are all traversed by the Northwest expansion. These counties are profiled in Tables 3.1-13 and 3.1-14. La Plata County is profiled in Section 3.6.1.8.1 Dolores County is a very rural county with fewer than 2,000 inhabitants. Very little economic activity occurs in the county where 638 people were employed in December of 1985.

Garfield ~~and-Montezuma--counties--are--similar~~ County is about 40 percent larger than Montezuma County in size and population. ~~-with Garfield-on-the-order-of-40-percent-larger-in-both-regards.~~ The 1984 population of Garfield County was 27,400 with an average of 13,717 employed. Both counties include some mining and light manufacturing with trade and services the predominant industries by relative numbers of employees.

Mesa County is the largest county in the study region in terms of both land area and population with over three times the population of the next most populated county, La Plata. Mesa County's population was an estimated 95,300 persons in 1984. The predominant industry in the county is trade, although this serves as a support industry to relatively large mining and manufacturing industries. Grand Junction is the largest city in Mesa County in the Colorado study region with a population of approximately 29,000.

Rio Blanco is almost as large as Mesa County in terms of area but with fewer inhabitants. Rio Blanco averages just over two inhabitants per square mile in comparison to almost 10 inhabitants per square mile in Garfield and 25 in La Plata. Rio

Blanco county has had a moderate growth rate in the last five years, averaging about two percent annually.

Table 3.1-15 profiles four Colorado cities in the study region: Durango, Cortez, Grand Junction, and Rangely. Durango was profiled in Section 3.6.1.8.1. Rangely is the smallest of the four cities with around a 15th of the population of Grand Junction, the largest city. There are temporary accommodations in all four towns, ranging in number from 82 in Rangely to approximately 2,000 in Grand Junction. Hospitals and public safety services exist in all four cities.

Utah Counties. Grand and San Juan counties are potentially affected by the Northwest expansion. These counties are profiled in Tables 3.1-13 and 3.1-14. Both counties are very rural with a little over one inhabitant per square mile. The populations of both counties have decreased slightly since 1980 reflecting the relatively few employment opportunities in the two counties and concentrations of those opportunities in industries that are not increasing in activity. Income levels in both counties are also lower than the state average, San Juan's in particular.

Low levels of public safety services are provided. Much of the water is obtained through private wells. One hospital is available in each county.

Moab, in Grand County, is the only major city in the two counties. As indicated in Table 3.1-15, Moab has 7,050 inhabitants. It is a rapidly growing city, increasing in population 33 percent since 1980. Incomes are relatively high in Moab, compared to other Utah cities, and a full range of adequate public services is available.

Wyoming Counties. The Northwest Expansion traverses Lincoln and Sweetwater Counties. These counties are profiled in Tables 3.1-13 and 3.1-14. Population of the counties in 1980 was 66,921 people. By 1984 the combined population had increased to 83,200 people.

Primary industries in the counties are trade and services. Mining is also relatively significant in these counties. Unemployment is similar to most of the other counties, at about 9 percent. Lincoln County has relatively more unemployment currently, resulting from the fact that much of the existing infrastructure is related to oil and gas development. The county has been hurt economically from the currently depressed oil and gas prices. Sweetwater County is a larger, more diversified county, although it too has been hurt ~~by the depressed oil and gas industry~~ since approximately one-third of its employment is in the industry.

The towns of Kemmerer in Lincoln County and Green River in ~~the~~ adjoining Sweetwater County are profiled in Table 3.1-15. The larger city of Rock Springs in Sweetwater County is also profiled in Table 3.1-15. These are the municipalities that are most likely to be affected by the Northwest Expansion. Total temporary accommodations in these three municipalities are 2,873. Occupancy rates in Rock Springs were 62.91 percent in 1984 with an average daily room rate of $36.17 [Pannell, Kerr, Forster, 1984]. Permanent housing units in the municipalities totalled 15,369 in 1980 with vacancy rates between 6.1 percent in Green River and 11.5 percent in Kemmerer.

3.6.3.8.2 Traffic

Refer to Section 3.1.8.2 for the methods used to compile transportation data.

The initial part of the Northwest expansion begins near Opal, Wyoming, and consists of seven loops in Wyoming, Colorado,and Utah on the existing Northwest pipeline. Mostly small county and local roads are crossed.

Because of its close proximity and rugged terrain, State Highway 139 is crossed by the Rangely Loops A and B many times north and south of Douglas Pass. Although the Emigrant Trail is within a half mile of the right-of-way of the Muddy Creek loop southwest of Granger, Wyoming, the trail becomes a local road at the actual crossing point. Near MP ~~1222~~ 266 the route of Rangely Loop A parallels Rangely-Dragon Trail road for about 3 miles south and west of the Rangely Compressor Station. Between 1906 and 1940 the road was known as the Rangely-Dragon Trail and used as a stage-freight route. A few portions of the original route are still visible although it is now a county road and thus heavily impacted. Table 3.6-33 shows the major crossings for each loop.

Table 3.6-33

TRANSPORTATION CORRIDOR CROSSINGS,
NORTHWEST EXPANSION PROJECT

Loops	U.S. Federal	State [1]	County & Local	Railroad [2]
Muddy Creek	U.S. 80	Wyo 374	13	UP
Green River	-	-	1	-
Rangely A & B	-	CO 139(13)	10	-
Cisco	-	CO 128	11	RGW
Moab	U.S. 163	-	13	-
Cahone	-	-	2	-

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[1] Number in parentheses indicates number of crossings

[2] UP = Union Pacific; RGW = Rio Grande Western

3.6.3.8.3 Noise

Estimated noise levels for the seven Northwest loop segments would be similar to those discussed for both the El Paso Base Case and 600 MMcfd Alternatives. Exceptions to this statement include Cisco and Cahone compressor stations. The nearest noise sensitive area to the Cahone compressor station is a ranch house approximately 0.7 mile southeast of the compressor station. No sound surveys have been completed for the Cahone or Cisco Stations. The nearest noise sensitive area to the Cisco Compressor Station is over five miles to the south-southeast.

3.6.3.8.4 Recreational Resources

Muddy Creek Loop. No designated recreational sites are within the mile-wide study corridor.

Green River Loop. The south end of the loop is about one mile west of the western boundary of Flaming Gorge National Recreation Area on the Green River. The nearest designated campground is three miles east of the loop.

Rangely Loop A. The loop parallels state Highway 139 and portions of Douglas Creek. ~~Sand Spring, a two acre designated public water reserve, is within the mile wide study corridor in Section 7, T3S, R101W, Rio Blanco County, Colorado.~~ Canyon Pintado National Register Historic District encompasses the pipeline ROW.

Rangely Loop B. No designated recreational sites are within the mile-wide study corridor. Several unimproved roads and jeep trails connecting with state highway 139 could be used by off-road vehicles and hikers traveling into the public lands within Book Cliffs and its foothills.

Cisco Loop. The loop ends at the northeast boundary of Arches National Park. The park has one 53-space campground in Devils Garden, approximately three miles south of the end of the loop. Throughout the loop several jeep trails and small roads may be travelled by visitors to the Colorado River and the park.

Moab Loop. For most of its route, the loop parallels or is close to U.S. Highway 163; several small roads lead from the highway to the surrounding canyon and mesa country south of Moab. Within the mile-wide study corridor are several named rock formations and springs: Kane Springs (and nearby public water reserve acreage), Looking Glass Rock, Lopez Arch, Red Rock, and White Rock.

Cahone Loop. Since all of the loop is on private land, public access is restricted. At the southern end of the loop, however, are McPhee and Narraguinnep Reservoirs on the Dolores River. None of the designated recreation areas at McPhee Reservoir are within one half mile of the corridor; camping, picnicking, a boat ramp, trailer spaces, and sanitation facilities are located at McPhee Recreation Complex approximately one mile northeast of the end of the loop. The Narraguinnep Reservoir has limited recreational facilities and was built primarily to store water for irrigation purposes. There are sanitation facilities and a boat ramp at the reservoir.

3.6.3.9 Land Ownership/Use

The Northwest Pipeline looping project consists of seven loops for a total of 162 miles in three states: Wyoming, Colorado, and Utah. It would traverse two counties in Wyoming (Lincoln and Sweetwater), five in Colorado (Rio Blanco, Garfield, Mesa, Dolores, and Montezuma) and two in Utah (Grand and San Juan). Table 3.6-34 shows the approximate number of miles crossed in each county by loop segment and also shows the ownership status of the lands. The land ownership categories are private, BLM, and state. The approximate locations of lands administered by each of these different entities are shown on the 1:250,000 scale maps in the map volume. The land use for the expansion project is categorized as agriculture (irrigated and non-irrigated), rangeland/grazing, forest/timber, commercial/industrial, residential, and other. Land uses by county and loop segment are presented in Table 3.6-35 and the approximate locations of each are shown on the maps in the map volume. Land use policies and regulations are shown in Table 3.6-36.

Muddy Creek Loop (MP 437.3-402.7) would traverse Lincoln and Sweetwater Counties in Wyoming. The land is used for grazing. Refer to Section 3.2.9.1 of Volume II for Lincoln County Plans. Sweetwater County does not require zoning variance permits for this area [Sweetwater County, 1982].

Green River Loop (MP 391.7-387.6) is also located in Sweetwater County, Wyoming. The existing land use is grazing. Sweetwater County does not have any zoning variance permits for this area [Sweetwater County, 1982].

~~Vernal Compressor Station (MP 329.8) is situated on leased state land and no additional land will be required. The surrounding land use is grazing.~~

Rangely Loop A (MP 277.7-246.9) is mostly located in Rio Blanco County with a small portion in Garfield County, Colorado. The predominant land use is grazing with the exception of a mile of irrigated farmland around MP 246. The land use also includes three transportation pipelines, associated gathering systems, Colorado state highway 139, county and BLM access roads, phone cables and electric transmission lines. Both counties require special use permits. Rio Blanco only allows pipelines to go through agriculture and heavy industrial zoned areas. Garfield requires an impact statement before approval.

Table 3.6-34

LAND OWNERSHIP, NORTHWEST EXPANSION PROJECT

Pipeline Component	County, State	Total	Private Miles	Private %	BLM Miles	BLM %	State Miles	State %
Muddy Creek 1/	Lincoln, WY	18.6	8.8	(48)	9.2	(49)	0.6	(3)
	Sweetwater, WY	16.0	8.7	(54)	6.8	(43)	0.5	(3)
Subtotal		34.6	17.5	[51]	16.0	[46]	1.1	[3]
Green River 1/	Sweetwater, WY	4.1	1.4	(33)	2.7	(67)	-	-
Rangely A 1/	Rio Blanco, CO	29.5	5.7	(20)	23.8	(80)	-	-
	Garfield, CO	1.3	1.3	(100)	-	-	-	-
Subtotal		30.8	7.0	[23]	23.8	[77]	-	-
Rangely B 1/	Garfield, CO	14.5	4.1	(28)	10.4	(72)	-	-
	Mesa, CO	1.7	-	-	1.7	(100)	-	-
Subtotal		16.2	4.1	[25]	12.1	[75]	-	-
Cisco 1/	Grand, UT	25.7	0.8	(3)	19.8	(77)	5.1	(20)
Moab 1/	Grand, UT	4.3	1.9	(44)	0.2	(5)	2.2	(51)
	San Juan, UT	30.5	5.0	(16)	16.5	(55)	9.0	(30)
Subtotal		34.8	6.9	[19]	16.7	[48]	11.2	[32]
Cahone 1/	Dolores, CO	1.4	1.4	(100)	-	-	-	-
	Montezuma, CO	14.9	14.9	(100)	-	-	-	-
Subtotal		16.3	16.3	(100)	-	-	-	-
TOTAL		162.5	54.0	[33]	91.1	[56]	17.4	[11]

1/ BLM 1:100,000 Surface Management Status Maps
BLM = Bureau of Land Management ( ) Percentages within county [ ] Total percentages within loop or line

Table 3.6-35

LAND USE, NORTHWEST EXPANSION PROJECT

Pipeline Component	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	%	Timber/ Forestland Miles	%	Irrigated/ Non-Irrigated Agriculture Miles	%	Residential Miles	%
Muddy Creek	Lincoln, Sweetwater, WY	34.6	34.6	(100)	-	-	-	-	-	-
Green River	Sweetwater, WY	4.1	4.1	(100)	-	-	-	-	-	-
Rangely A	Rio Blanco, Garfield, CO	30.8	29.8	(97)	-	-	1.0	(3)	-	-
Rangely B	Garfield, Mesa, CO	16.2	15.7	(97)	0.5	(3)	-	-	-	-
Cisco	Grand, UT	25.7	25.7	(100)	-	-	-	-	-	-
Moab	Grand, San Juan, UT	34.8	33.3	(96)	-	-	-	-	1.5	(4)
Cahone	Dolores, Montezuma, CO	16.3	-	-	-	-	16.3	(100)	-	-
Total		162.5	143.2	(88)	0.5	(0)	17.3	(11)	1.5	(1)

Table 3.6-36
FEDERAL, STATE, AND COUNTY LAND USE REGULATIONS AND POLICIES, NORTHWEST EXPANSION PROJECT

Administrative Agency	Document	Policies/Requirements
FEDERAL		
Department of Interior Bureau of Land Management		locate within designated utility corridors
Kemmerer District, WY Rock Springs	Resource Managemet Plan Kemmerer RA	not within but not subject to corridor concept
Grand Junction District, CO	Resource Management Plan	within utility corridor
Montrose District, CO	Resource Management Plan	within utility corridor
Vernal District, UT	Resource Management Plan	within utility corridor
Moab District, UT	Resource Management Plan	within utility corridor
Craig District, CO	White River RSRA, Management Framework Plan	within established utility corridors
STATE		
Colorado	No response after three requests	
Utah	Rules and Regulations Governing the Issuance of Rights of Way and Right of Entry, 1982	apply for permit
Wyoming		no identified land use regulations concerning interstate pipelines
COUNTY		
Lincoln, WY	Developer Packet and Planning Program	apply for conditional use permit
Sweetwater, WY	Final Land Use Plan, 1977 - Zoning Resolution for Sweetwater County, 1982	apply for right of way permits
Rio Blanco, CO	Rio Blanco County Master Plan, 1983 Zoning Regulations	apply for special use permit
Garfield, CO	Special Use Permit and Rules for Industrial Operations	apply for special use permit and submit impact statement
Mesa, CO	Land Use and Development Policies, Chapter 9 and 11 of County Zoning Ordinances	subject to conditional use requirements
Grand, UT	Plan in preparation	no identified existing plans
San Juan, UT	Chapter 10 and 11 of the San Juan County Zoning Ordinances	apply for conditional use permit
Dolores, CO		apply for permits
Montezuma, CO	Regulations for Site Selection, Construction of Major Microwave Stations, Electric Transmission Lines, Pipelines, Power Plants, Pumping Plants, Pumping Stations, and Related Activities	apply for permits

Rangely Loop B (MP 239.9-223.7) is situated in Garfield and Mesa Counties, Colorado. Except for the first 0.5 mile of this loop the land use is grazing. From MP 239.9-240.2 the land is used for commercial timbering. Refer to Loop A for Garfield County Regulations. Mesa County considers pipelines to be a conditional use and requires a permit.

Cisco Loop (MP 195.6-169.9) is located in Grand County, Utah. The land use is livestock grazing. It passes within 0.5 mile of the town of Cisco. The last mile of the Cisco Loop is within 0.5 mile of the Lost Spring Canyon Wilderness Study Area (WSA).

Grand County has no identified land use plans concerning pipeline locations [Grand County, 1968]. The new comprehensive plan that is presently being prepared may include such plans. The Cisco Compressor Station ~~is~~ would be located on BLM land at MP 195.6. The land use is grazing.

Moab Loop (MP 145.6-110.8) is situated in Grand and San Juan Counties in Utah. The primary land use is grazing except for 1.5 mile of residential/commercial development that begins at about MP 116.8. Refer to the Cisco Loop for Grand County information. San Juan County requires a special use permit. Residential and commercial development in Spanish Valley would fall less than 50 feet from the route potentially impacting up to ten places.

Cahone Loop (MP 67.9-51.6) is located in Dolores and Montezuma Counties in Colorado. The land is presently being used for grazing and non-irrigated agriculture but much of it will probably become irrigated when the Bureau of Reclamation completes the canal system currently under construction [Bulinski, 1986]. Dolores County has no identified land use or zoning plans [Magness, 1986]. Montezuma County requires that the pipeline company must apply for and receive permits before construction. The Cahone Compressor Station would be located on private land used primarily for nonirrigated agriculture at MP 67.9.

Ignacio Compressor Station (MP 0.0) is located on land owned by Northwest Pipeline Company. The land use of the surrounding area is rangeland with some agriculture.

3.6.3.10 Cultural Resources

3.6.3.10.1 Archaeology

The cultural resources located in the mile-wide analysis corridors associated with the Northwest expansion loops are presented in Tables 3.6-37 and 3.6-38 which summarize numbers of sites and their National Register status and data on site types. The data in these tables reflect the information available as of April 1986. There have been numerous surveys along or directly adjacent to the pipeline loops because of the MAPCO Pipeline Project and others. This partially explains the relatively high site density along much of the route. Nonetheless, prior to pipeline construction it may be necessary to conduct intensive on-the-ground surveys along those portions of the construction ROW not yet fully surveyed. Please note that the tables in this section summarize the known cultural resources within the mile-wide corridors. The discussion of those sites situated within the construction ROW will be presented in the impact section.

The tables summarizing and interpreting the cultural resources for the Northwest Expansion Project are based on the data presented in some detail in the cultural resources technical report. Details on previous survey coverage and an overview of the prehistory, history and ethnohistory of the project area are also contained in the technical report.

Table 3.6-37

KNOWN CULTURAL RESOURCE SITES, NORTHWEST EXPANSION PROJECT

	Sites and National Register Status [1]			
State and Pipeline Loop	Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
WYOMING				
Muddy Creek	1 [2]	0	6 [3]	90
Green River	0	0	0	1
COLORADO				
Rangely A	6	0/1	2 [3]	179
Rangely B	0	1/0	2	27
UTAH				
Cisco	0	0	0	21
Moab	0	0	0	102
COLORADO				
Cahone	9	0/1	8 [3]	73
Total Sites	16	1/2	18	493

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[1] National Register status here refers only to the results of official determinations. Many other sites may meet the eligibility criteria but have not been formally evaluated.

[2] If the Emigrant Trail has integrity where it crosses the pipeline, it would also qualify for NRHP status.

[3] Except for two sites on the Cahone Loop, all ineligible sites on these loops have been destroyed.

Please note that the two "sites" nominated to the National Register are actually archaeological districts. A total of 172 sites situated within the analysis corridor of the Rangely Loop A are part of the Canyon Pintado Archaeological District. Five sites located within the analysis corridor of the Cahone Loop are part of the Anasazi Archaeological District.

Table 3.6-38

KNOWN CULTURAL RESOURCE TYPES, NORTHWEST EXPANSION PROJECT

	Pipeline Loops 1/						
Type	Mud Crk	Gre Riv	Rang A	Rang B	Cis	Moab	Cah
Habitation							
Camp	(9)	-	7(2)	4	(3)	1(22)	38(1)
Camp+Hearth	1	-	21(2)	1	-	-	1
Pithouse	-	-	-	-	-	-	1
Scatters							
Lithic	47	1	22(6)	2(1)	16(1)	79(2)	5
Ceramic	1(1)	-	-	-	-	1	-
Groundstone	1(1)	-	-	-	-	-	(1)
Bone	-	-	(1)	-	-	-	-
Lithic+Ceramic	3(1)	-	1(2)	1(2)	1	1	2(3)
Lithic+Groundstone	4	-	1	2(1)	-	6	-
Ceramic+Groundstone	1(1)	-	-	(1)	-	-	-
Lithic+Fire Altered Rock	15	-	-	1	-	-	-
Lithic+Ceramic+ Groundstone	-	-	-	1	-	-	3(1)
Features							
Structure	-	-	6	1	-	-	-
Structure and Roasting Pit	-	-	-	-	-	-	26(1)
Structure+Midden	-	-	-	-	-	-	3
Structure+Cistern	-	-	-	-	-	-	2
Roasting Pit	-	-	-	-	-	-	2
Hearth(s)	2	-	2(2)	3	(1)	-	-
Hearth+Lithics	14	-	(1)	-	-	-	-
Rockshelter	-	-	18	2	3	1	1
Rockshelter+Hearth	-	-	16	-	-	-	-
Rockshelter+Midden	-	-	3	-	-	-	-
Petroglyphs	-	-	47(2)	3	-	-	-
Rockshelter and Petroglyphs	-	-	12	-	-	-	-
Rockshelter+Petro-glyphs+Structure	-	-	3	-	-	-	-

Table 3.6-38 (continued)

KNOWN CULTURAL RESOURCE TYPES, NORTHWEST EXPANSION PROJECT

	Pipeline Loops[1]						
Type	Mud Crk	Gre Riv	Rang A	Rang B	Cis	Moab	Cah
Granary	-	-	2	-	-	-	(1)
Rockshelter+Granary	-	-	5	-	-	-	-
Quarry	2	-	-	-	1	7	-
Rock Alignment	1	-	-	1	-	-	1
Cairn	-	-	1	-	-	-	1
Burial	-	-	1	-	-	-	-
Midden	-	-	(3)	-	-	-	-
Honing Surface	-	-	1(1)	-	-	-	-
Wall	-	-	1(1)	-	-	-	-
Other	-	-	(4)	-	-	-	-
Historic Features							
Historic Trash	2(4)	-	3(1)	(5)	(1)	-	-
Historic Dump	-	-	-	-	-	1	-
Habit./Structure	-	-	6	1	-	1	1(1)
Wickiup	-	-	2	-	-	-	-
Ramada	-	-	1(1)	-	-	-	-
Corral	-	-	-	1	-	-	-
Trail	1	-	-	-	-	1	-
Irrigation Canal	-	-	-	-	-	-	2
Line Herding Camp	-	-	1	5	-	-	-
Sheep Camp	2(1)	-	-	-	-	-	-
Lime Kiln	-	-	-	-	-	1	-
Isolated Finds	-	-	-	1	-	-	1
Other	-	-	1	-	-	1	-
Archaeological District	-	-	1	-	-	-	1
Unknown	-	-	3	-	-	-	1
Total Sites	97	1	188	30	21	102	91

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[1] Mud Crk = Muddy Creek Loop; Gre Riv = Green River Loop; Rang A = Rangely Loop A; Rang B = Rangely Loop B; Cis = Cisco Loop; Moab = Moab Loop; Cah = Cahone Loop.

Figures in parentheses refer to additional instances occurring at sites already counted once in the table.

Summary. Of the 162.5 miles of looping for the Northwest Expansion Project, 80 miles (49.1 percent) of construction ROW have been covered by previous surveys and another 38.5 miles may have had close to complete coverage. In addition, other surveys were directly adjacent to (or perhaps covering) the construction ROW for another 9.85 miles. In short, about half, if not over two-thirds, of these expansion loop construction ROWs have already been surveyed. A total of 530 cultural resource sites have been documented within the mile-wide analysis corridors. The loops pass through ~~one~~ two archaeological districts that ~~is~~ are on the National Register, the Canyon Pintado Archaeological District (Rangely Loop A) and the Anasazi Archaeological District (Cahone Loop) ~~has been nominated~~. Six sites within the Canyon Pintado district and nine sites within the Anasazi district are listed on the National Register. ~~Ten sites have~~ One site has been determined to be eligible for the register.~~, nine of those within the Anasazi district.~~ In addition, if the California Emigrant Trail has integrity where it crosses the pipeline route (Muddy Creek Loop), it would also qualify for NRHP status. Eighteen sites have been determined to be ineligible, 16 of which have been destroyed.

There are three very high and two high sensitivity pipeline segments along these loops.

3.6.3.10.2 American Indian Concerns

Although none of the expansion loops cross or come close to existing American Indian reservations, the Ute Indian Tribe (Ute Tribal Museum in Duchesne, Utah) stressed that part of southwestern Wyoming, all of eastern Utah, and the western half of Colorado were once the traditional home of the Utes. In short, all of the Northwest expansion loops are involved. The Ute expressed concern for all ancestral (archaeological) sites and their excavation, particularly of burial sites. Concern was also expressed for the preservation of traditionally utilized plant and animal species.

3.6.3.11 Paleontological Resources

Paleontologic resources for the Northwest Project have been divided into looped segments. Table 3.6-39 lists the formations for the project. A more detailed discussion of all of the paleontologic resources has been provided in the Paleontologic Resource Assessment Technical Report [Morales et al., 1987].

3.6.3.12 Visual Resources

The scenic environment of the study area is widely varied. Generally, high elevation plains and intermittent mountain slopes characterize the landform along the existing Northwest pipeline.

Table 3.6-39

PALEONTOLOGICAL FORMATIONS, NORTHWEST EXPANSION PROJECT

Age	Formation	Potential[1]/ Vertebrate/ Invertebrate	Sensitivity
MUDDY CREEK LOOP			
Eocene	Bridger Formation	H/L	Yes
Eocene	Laney Shale	H/H	Yes
Quaternary	Quaternary terrace deposits	L/L	No
Quaternary	Quaternary alluvium	L/L	No
Quaternary	Quaternary sand dunes	L/L	No
GREEN RIVER LOOP			
Eocene	Bridger Formation	H/L	Yes
Eocene	Laney Shale	H/H	Yes
RANGELY LOOP A			
Cretaceous	Williams Fork Formation	H/L	Yes
Upper Cretaceous	Upper Mesa Verde Group	H/H	Yes
Upper Cretaceous	Mesa Verde Group	undetermined	unknown
RANGELY LOOP B			
Cretaceous	Hunter Canyon Formation	L/L	No
Cretaceous	Mount Garfield Formation	L/H	No
Cretaceous	Sego Sandstone	L/H	No
Upper Cretaceous	Mancos Shale	M/M	No
CISCO LOOP			
Upper Cretaceous	Upper Mancos Shale	M/M	No
Upper Cretaceous	Ferron Sandstone	L/H	No
Upper Cretaceous	Mancos Shale	L/H	No
Upper Jurassic	Morrison; Salt Wash Member	H/L	Yes
Middle Jurassic	Summerville Formation	L/L	No
Middle Jurassic	Entrada Sandstone	L/L	No
MOAB LOOP			
Late Triassic	Chinle Formation	H/H	Yes
Jurassic	Kayenta Formation	H/L	Yes
Upper Triassic	Wingate Sandstone	H/L	Yes
Jurassic	Navajo Sandstone	L/L	No
Upper Jurassic	Morrison; Salt Wash Member	H/L	Yes
Middle Jurrassic	Summerville Formation	L/L	No
Middle Jurassic	Entrada Sandstone	L/L	No
Quaternary	Quaternary alluvium and eolian	L/L	No
CAHONE LOOP			
Upper Cretaceous	Dakota Formation	L/H	No
Quaternary	Quaternary sand dunes	L/L	No
Upper Cretaceous	Mancos Shale	L/H	No

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[1] L = low M = moderate H = high

Dramatic landforms occur in the study area. Vegetation also varies greatly throughout the study area and includes grasslands, subalpine and alpine meadows, and heavily forested slopes of pine and aspen.

The color of this mid-mountain landscape includes a wide spectrum of greens in the vegetative areas. Dark forest greens and light grass greens are common. Vibrant earth tones of red, orange, and brown are also visible on steeper, unforested slopes. Textures are medium to coarse for the mountain areas, smooth to fine for the plains and wash areas.

Man-made features become more dominant in urbanized areas such as the Grand Valley of the Colorado River with communities such as Mack and Cisco. There are no known architectural structures of scenic significance.

The BLM has categorized the scenic resources within the study area. The predominant visual resource management classes in the study area are identified by line and milepost segments. Refer to Section 3.2.12 for the methods employed in the description of scenic resources.

Muddy Creek Loop

MP 437.3-402.7, VRM/VQO: BLM Class III, IV
Description: The landform consists of flat to gently rolling foothills, to high elevation (6,500 feet) grasslands crisscrossed by creeks. The vegetation consists primarily of mixed desert shrub. Modifications include the existing Northwest pipeline, Interstate 80, the Union Pacific Railroad, ranch roads, small oil production fields, and utility service roads.

Green River Loop

MP 391.7-387.6, VRM/VQO: BLM Class III
Description: The landform consists of transitional slopes from high elevation (approximately 6,200 feet) plains to lower mountain foothills (approximately 5,500 feet). The vegetation consists of mixed desert shrub. Modifications include the existing Northwest pipeline, Highway 530, and pipeline service roads.

Rangely Loop A

MP 277.7-246.9, VRM/VQO: BLM Class III, IV
Description: The landform, at approximately 6,200 feet, consists of sandstone bluffs and deeply dissected drainages. Douglas Creek is at the base of the Douglas Creek Canyon towards Douglas Pass. The vegetation consists of a diverse mixture of mixed desert shrub, greasewood, sagebrush in the drainage areas, and

pinyon-juniper woodlands on the slopes. Modifications include the existing Northwest pipeline, two other natural gas transmission ~~and gathering lines~~ pipelines, electric and telephone utility lines, Highway 139, and ~~pipeline-service~~ county and BLM access roads.

Rangely Loop B

MP 239.9-223.7, VRM/VQO: BLM Class III, IV
Description: The landform consists of a narrow canyon and river/wash area enclosed by sandstone bluffs. The pipeline continues out of the canyon areas (approximately 6,200 feet), and into a landform characterized by rolling foothills (approximately 4500 feet). The vegetation consists of mixed desert shrub, greasewood, sagebrush in the drainage areas, with pinyon-juniper woodlands on the drier slopes and open grasslands in the foothills. Modifications include the existing Northwest Pipeline, Highway 139, Douglas Pass Road, ranches, a corral, unpaved access roads, and drill holes.

Cisco Loop

MP 195.6-169.9, VRM/VQO: BLM Class IV
Description: The landform consists of a wide flat river valley (Grand Valley) at approximately 4500 feet elevation rising through transitional slopes of the highlands. The Cisco Loop ends at the northeast boundary of Arches National Park. The pipeline would be visible from the northeastern portions of Arches National Park. The vegetation includes limited tamarisk scrub, riparian and mixed desert scrub. Modifications include the existing Northwest Pipeline, Interstate 70, U.S. Routes 6 and 50, ranches, oil and gas wells, unpaved service/access roads, the Denver and Rio Grande Western Railroad, and the town of Cisco.

Moab Loop

MP 145.6-110.8, VRM/VQO: BLM Class II,III
Description: The landform, characterized by sandstone formations, consists of a narrow high elevation valley (Spanish Valley) at approximately 5000 feet elevation crossed by Kane Springs, rising steeply up the face of a ridge and into a series of high elevation arid mesas and Dry Valley (approximately 6000 feet). The vegetation consists of mixed desert shrub, greasewood, sagebrush in the drainage areas, with pinyon-juniper woodlands on the drier slopes. Modifications include the existing Northwest Pipeline, U.S. Route 160, Highway 46, ranches, ranch access/service roads, mines, and the town of Moab.

Cahone Loop

MP 67.9-51.6, VRM/VQO: ~~Private Land~~ FS Class R
Description: The landform consists of transitional slopes that range from approximately 6750 to 6900 feet with a several narrow canyons falling away to the southwest. The vegetation is characterized by cropland and limited pinyon-juniper woodlands. Modifications include the existing Northwest Pipeline, U.S. Route 160, Highway 147, and the towns of Cahone, Pleasant View, Yellow Jacket, Lewis, and Lebanon.

3.7 TRANSWESTERN EXPANSION PROPOSAL

3.7.1 Air Quality

The existing West Texas Lateral, originating at Pyote, Texas, travels northwestward from Pyote, crosses the Texas/New Mexico border and terminates at Roswell, New Mexico. The nearest PSD Class I area is the Carlsbad Caverns National Park, which is about 50 miles west of the proposed pipeline. The relevant air quality data gathered from monitoring stations near the proposed West Texas Lateral and mainline loops in New Mexico are shown in Table 3.7-1. Arizona air quality data are shown in Table 3.1-2.

3.7.2 Geology

The Transwestern Expansion Proposal would extend through varying geologic features in the states of Texas, Arizona, and New Mexico. These geologic and physiographic features along the proposed loops are discussed below and presented in Table 3.7-2. No major slope stability or ground subsidence problems have been identified along most of the loops. Exceptions include karst terrain along Loop A, a large landslide deposit along Loop C on the northeast side of Mesa Lucero, and landslides and rockfalls along Loops G and I in the Elden Mountain and Black Mountain areas, respectively.

No unique geologic features of significant interest occur along any of the proposed loops except for the Malpais lava beds and the Continental Divide along Loop D, and the Hopi Buttes and Painted Desert along Loop F.

Seismicity varies from low to moderately high throughout the project area. Earthquake ground acceleration values, which are estimated to have a 90 percent probability of not being exceeded in 50 years vary from less than 4 percent of gravity for most of the proposed project area, to about 18 percent of gravity along portions of Loops B and C in the Rio Grande Rift area. Loops C, G, and H may cross Quaternary faults.

Table 3.7-1
SUMMARY OF RELEVANT AIR QUALITY DATA IN WEST TEXAS AND CENTRAL NEW MEXICO

		O_3 (ppm)	NO_2 (ug/m^3)		SO_2 (ug/m^3)				TSP (ug/m^3)		CO (mg/m^3)	
Station	Year	Maximum 1-Hr	Max 1-Hr	Annual Mean	Max 1-Hr	Max 3-Hr	Max 24-Hr	Annual Mean	Max 24-Hr	Annual Mean	Max 1-Hr	Max 8-Hr
TEXAS												
Odessa	1982	0.13	132	56	288	157	26	-	127	63	16	6
	1983	0.11	132	56	498	262	26	-	131	49	12	7
	1984	0.12	113	38	262	210	26	-	266	43	13	5
Midland	1982	-	-	-	-	-	-	-	259	84	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	345	61	-	-
NEW MEXICO												
Montgomery & San Mateo (Albuquerque)	1982	0.10	94	38	-	52	26	-	159	63	22	16
	1983	0.10	-	-	-	52	26	-	145	62	21	13
	1984	0.09	-	-	-	52	26	-	207	91	21	13
Belen	1982	-	-	-	-	-	-	-	212	78	-	-
	1983	-	-	-	-	-	-	-	203	62	-	-
	1984	-	-	-	-	-	-	-	226	78	-	-
Roswell	1982	-	-	-	-	-	-	-	216	77	-	-
	1983	-	-	-	-	-	-	-	211	79	-	-
	1984	-	-	-	-	-	-	-	153	67	-	-
Artesia Roselawn St	1982	-	-	-	-	-	-	-	-	-	-	-
	1983	-	-	-	-	-	-	-	-	-	-	-
	1984	-	-	-	-	-	-	-	318	-	-	-
Artesia 13th St	1982	-	-	-	-	-	-	-	138	46	-	-
	1983	-	-	-	-	-	-	-	135	46	-	-
	1984	-	-	-	-	-	-	-	219	44	-	-
Carlsbad 13th St	1982	-	-	-	-	-	-	-	170	67	-	-
	1983	-	-	-	-	-	-	-	396	75	-	-
	1984	-	-	-	-	-	-	-	281	60	-	-

Table 3.7-2

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, TRANSWESTERN EXPANSION PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Loop 1 (MP 0.0-4.1) Loop 2 (MP 77.5-88.0)	High Plains	Alluvium	Quaternary	Low relief, low slope	Unconsolidated deposits of gravel, sand, silt, clay
Loop A (MP 29.0-55.0) Loop B (MP 86.6-131.3)	High Plains Southern Rocky Mountains	Sedimentary rock	Permian, Pennsylvanian	Low to moderate relief, low to moderate slopes	Moderately hard to hard sandstone; sequences of gypsum, carbonates, and clastic rocks
Loop C (MP 173.25-200.5)	Colorado Plateau	Alluvium, sedimentary rock, volcanic rocks	Quaternary to Permian, Triassic to Jurassic	Low relief in drainage areas, high relief near mesas	Unconsolidated to poorly consolidated surficial deposits, includes locally occurring landslides and dune deposits. Moderately hard to hard basalts. Sedimentary rocks are massive.
Loop D (MP 224.0-271.3)	Colorado Plateau	Alluvium, sedimentary rock, some volcanic rocks	Quaternary, Mesozoic	Low relief in drainage areas. high relief near mesas	Unconsolidated surficial deposits, includes landslides or rock falls from mesas. Hard basalt flows.
Loop E (MP 303.3-340.8)	Colorado Plateau	Sedimentary rock	Tertiary Mesozoic Permian	Moderate to high relief with canyons	Massive, thick bedded sedimentary rocks
Loop F (MP 375.3-416.8)	Colorado Plateau	Alluvium, sedimentary rock. Dune sands, some volcanic rock	Quaternary, Tertiary, Jurassic to Triassic	Low to moderate relief, drainage areas, small steep buttes	Locally active wind-blown sands and small dunes. Unconsolidated alluvial deposits, hard basalt flows.

Table 3.7-2 (continued)

GEOLOGIC AND PHYSIOGRAPHIC CONDITIONS, TRANSWESTERN EXPANSION PROPOSAL

Location	Geol/Phys Province	Geologic Unit	Age	Topography	Comments
Loop G (MP 449.0-460)	Colorado Plateau	Volcanic rocks, alluvium	Quaternary	Moderate to high relief. Moderate to steep slopes.	Unconsolidated alluvial deposits consisting of boulders, gravel and sand. Basalt flows and cinder cones.
Loop G (MP 460-469)	Colorado Plateau	Alluvial deposits, volcanic rocks	Quaternary	Moderate to high relief. Steep sifted slopes.	Hard basalt flows with boulder and rock falls.
Loop G (MP 469-485.5)	Colorado Plateau	Volcanic rocks, alluvial deposits	Quaternary	Moderate to high relief. Moderate slopes	Rock falls consisting of boulders, gravel and sand. Basalt flows.
Loop H (MP 526.8-576.3)	Colorado Plateau-Basin and Range	Alluvium, sedimentary rock, volcanic rock, granites and metamorphic rocks.	Quaternary to Tertiary, Mississippian to Devonian, Precambrian	Low to high relief. Moderate slopes, steep on mesas.	Unconsolidated to moderately consolidated alluvial deposits. Basalt flows, granites, gneisses are hard to very hard. Thick bedded sedimentary rocks.
Loop I (MP 613.0-644.5)	Basin and Range	Alluvial fans, floodplains, volcanic rocks	Quaternary to Tertiary, Cretaceous	Low relief, low slopes in floodplains. High relief with steep slopes in mountain passes.	Alluvial deposits, firmly consolidated floodplain deposits. Rhyolite to andesite flows.

Loop 1. The proposed route for Loop 1 lies within the High Plains of west Texas. This segment of the pipeline would traverse Quaternary alluvial fans of low relief.

Loop 2. Proposed Loop 2 of the West Texas Lateral would traverse the High Plains of southeast New Mexico. The route crosses topography of low relief which is underlain by Quaternary alluvial deposits and bolson deposits.

Loop A. This proposed loop would lie in the High Plains of southeast New Mexico. The route is underlain by Paleozoic limestone as it crosses topography of low relief [Lochman-Balk, 1967].

Proposed Loop A crosses limestone which is known to be karstified to a depth of 0 to 100 feet below the surface [Lockman-Balk, 1967].

Loop B. Proposed Loop B of the Transwestern Mainline would lie within the eastern boundary of the Rio Grande Rift and in the Southern Rocky Mountains. The topography consists of hills of low to moderate relief. The geology underlying the route is generally consolidated sedimentary rock.

Proposed Loop B lies in an area of low seismicity, with no earthquake epicenters occurring within 40 miles of the loop [NOAA, 1985]. Northrop [1976] reports that the 1906 Socorro and the 1918 Cerillos earthquakes (both of intensity VIII) had their epicenters within 100 miles of Loop B, and that both were related to the western boundary of the Rio Grande Rift. The Rio Grande Rift eastern boundary fault crosses within approximately two miles of the western end of Loop B (MP 133).

Loop C. Proposed Loop C would lie within the Datil-Mogollon volcanic section of the Colorado Plateau. The proposed route crosses diverse topography, varying from low drainage areas to moderate to high relief along mesas. The geologic materials consist generally of alluvium and sedimentary rocks with volcanic rocks occurring locally.

Loop C would be situated at the western edge of the Rio Grande Rift, which is an area of high seismicity [Sanford et al., 1979]. The 1906 Socorro and the 1918 Cerillos earthquakes (intensity VIII) are related to the western boundary of the Rio Grande Rift [Northrop, 1976]. Dane and Bachman [1965] identify Quaternary faults at MP 177 and another at MP 179.

Proposed Loop C passes close to the toe of a large landslide deposit on the northeast side of Mesa Lucero (MP 180) [Dane and Bachman, 1965].

Loop D. Proposed Loop D of the Transwestern Mainline would traverse the Datil-Mogollon volcanic section of the Colorado Plateau in western New Mexico. The proposed route traverses sedimentary, volcanic and alluvial deposits situated on low relief drainages and bordering high relief mesas.

Olsen [1979] reports several earthquakes within the area of Loop D between 1973 and 1978, the largest being of magnitude 4.0 about 10 miles north of Grants, New Mexico. Kittel et al. [1967] show seven faults crossed by Loop D between MP 229 and MP 250 and another at MP 253, but no known Holocene movement has occurred.

The only unique geologic features which exist along the proposed route are the Malpais lava beds (MP 241.5-244) and the Continental Divide (MP 263). Loop D passes through the Grant's Pass uranium region, one of the most productive in the United States [Arnold and Hill, 1980].

Loop E. Proposed Loop E of the Transwestern Mainline would lie within the Colorado Plateau of northwestern New Mexico and northeastern Arizona. The proposed route traverses topography characterized by moderate to high relief dissected by steep canyons. The geologic formations present consist predominantly of sedimentary rocks.

A moderate degree of slope instability exists for the region around MP 316 on the proposed route for Loop E. The route is situated near some deep canyons.

Subsidence has occurred in the coal mining region near the eastern end of the proposed loop [Transwestern Pipeline Co., 1985]. Transwestern's existing mainline has not been affected by coal mine subsidence.

The eastern region of proposed Loop E is underlain by coal, and coal production occurs in the vicinity of the loop [Arnold and Hill, 1980].

Loop F. Proposed Loop F of the Transwestern Mainline would be located within the Colorado Plateau of northeastern Arizona. The proposed route traverses a canyon region of moderate relief and a low relief drainage area. The geology is predominantly sedimentary rocks and alluvial deposits.

The only unique geologic features that occur along the proposed route of Loop F are the Hopi Buttes (MP 380) and the Painted Desert (MP 410).

Loop G. Loop G would lie within a volcanic section of the Colorado Plateau in north-central Arizona. The topography of the proposed route is characterized by moderate to high relief as the route passes the San Francisco Peaks. The geology consists of alluvial deposits interspersed with basalt flows and cinder ash from Sunset Crater.

Proposed Loop G lies in Coconino County, Arizona, where 52 earthquake epicenters were recorded from 1892 to 1980 [Du Bois et al., 1982]. The north-south trending Oak Creek Canyon fault has been mapped for about 25 miles south of I-40 and may extend across the ROW at about MP 470. Also, a MM VIII event in 1906 was located in the immediate vicinity of the proposed route about one to two miles northeast of Elden Mountain.

Aerial reconnaissance of the proposed route revealed landslides on Elden Mountain near Schultz Pass along with rockfalls on the southern slopes west of Flagstaff, Arizona.

Loop H. Proposed Loop H would originate within a volcanic section of the Colorado Plateau and would cross into the Basin and Range region of west-central Arizona. The topography of the proposed route is characterized by low to moderate relief. The proposed route is underlain by basins of alluvial deposits and mountains of sedimentary and igneous rocks as the physiographic provinces change.

Proposed Loop H lies in Yavapai and Mohave Counties, Arizona, where a total of 24 earthquake epicenters were recorded from 1870 to 1971 [Du Bois et al., 1982]. Loop H crosses one fault with an escarpment of greater than 50 meters at approximately MP 528. This fault may have had late-Quaternary movement. West of Seligman (between MP 540 and 576) Loop H may cross southern extensions of the Toroweap and Hurricane faults. Both are major tectonic features of the western Colorado Plateau and both exhibit evidence of Holocene activity in the Grand Canyon area [Huntoon, 1977].

Aerial reconnaissance revealed rockfalls throughout the route as it traversed regions of high relief accompanied by steep slopes.

Loop I. Proposed Loop I of the Transwestern Mainline would lie within the Basin and Range region of western Arizona. The topography varies from low relief drainages to high relief with steep slopes in the Black Mountains. The geology consists of alluvial fan deposits accompanied by rhyolite and andesite flows forming the mountainous regions. Several large gold lodes were discovered in this area between 1900 and 1917, and recently, exploration activity has increased in the district.

Landslides and rockfalls were observed within the Black Mountains along MP 623-632.

3.7.3 Soil

The distribution of soil mapping units along the loops of the Transwestern Expansion Proposal and the characteristics of the individual soils that comprise the soil mapping units are presented in Appendix A-4.

The general comments on the origin and importance of this soil information made in Section 3.1.3 apply to this proposal.

The proposal would traverse soils typical of the Great Plains, Basin and Range, Colorado Plateau, and the Mojave Desert geographic regions. The general character of soils that occur along the proposed loops in the Colorado Plateau, Basin and Range, and Mojave Desert Regions can be found in the Soils Section of the Mojave and El Paso proposals.

Loop 1. Proposed Loop 1 would lie within the Great Plains region and would traverse shallow, loamy soils of upland sediments. The soils in the Great Plains Region formed in material derived from sedimentary rocks, and have often been modified by wind and water. Soil development ranges from little horizon differentiation on surfaces of recent age, to soils with well developed calcareous hardpans. A few soils have developed subsoils. Surface organic matter content is low to moderate. Nearly all the soils along this loop are underlain by caliche at depths beginning at less than 20 inches. The sediments along the latter third of the loop are high in gypsum. Soils identified along Loop 1 occupy level to rolling topography. Soil susceptibility to water erosion is low, and wind erosion potential is evenly distributed from low to high. Reclamation potential is poor. Shallow soils and gravelly textures are the primary restrictive factors [SCS,1975c].

Loop 2. Proposed Loop 2 would lie within the Great Plains region and would traverse predominantly deep, sandy soils of plains and low hills. These sandy soils have developed in wind-worked sandy deposits and occur as elongated dunes and blow-out areas associated with dune land. Shallow, sandy, and loamy soils are less common, are underlain by caliche at less than 20 inches, and occur on level to gently undulating uplands. Soil susceptibility to water erosion is mostly low except along the northwest end of the loop where it is high. Wind erosion potential is moderate to high, but mostly high. Reclamation potential for component series are rated mostly poor with some areas of good potential. The sandy textures, drifting sands and shallow soils are the primary limiting factors [SCS,1971; 1974].

Loop A. Proposed Loop A would lie within the Great Plains region and would traverse predominantly shallow soils of hills and mesa side slopes. Deep, loamy soils are less predominant and occur on valley sides and in alluvial bottoms. Susceptibility to water erosion is evenly distributed from low to high. Wind erosion potential is low to moderate but mostly moderate. Reclamation potential is mostly poor on shallow soils, with some good potential on deep soils [SCS, 1983b].

Loop B. Proposed Loop B would lie within the Basin and Range region and would traverse predominantly deep and very deep soils of upland plains, rolling hills, and alluvial fans and valleys. Shallow soils are less predominant and occur in rocky areas on hillsides, mesa escarpments, and breaks. Soil susceptibility to water erosion is mostly low, but ranges from low to high. Wind erosion potential is mostly low to moderate. Reclamation potential is evenly distributed from poor to good [SCS,1970; 1975b; 1983b].

Loop C. Proposed Loop C would lie within the Colorado Plateau region and would traverse predominantly deep soils of uplands and alluvial bottoms. Shallow soils are less common and occur in rocky areas of old lava flows and on hillsides, mesa escarpments, and breaks. Soil susceptibility to water erosion is mostly low with moderate to high susceptibility on steeper slopes. Wind erosion potential is low to moderate. Reclamation potential is evenly distributed from good to poor. Cobbly, gravelly, sandy, or clayey textures are the primary factors responsible for the rating of poor [SCS,1975b].

Loop D. Proposed Loop D would lie within the Colorado Plateau region and would traverse predominantly deep soils of undulating to steep uplands and alluvial bottoms. Shallow to moderately deep soils are less predominant and occur in old lava flows and rocky, rough, and broken terrain. Susceptibility to water erosion is mostly low to moderate. Wind erosion potential is low to moderate, but mostly moderate. Reclamation potential is mostly fair to poor with some areas of good potential. Shallow soils, and stony to gravelly, sandy, or clayey textures are the primary factors responsible for the rating of poor [BLM, 1972; Maker et al. 1978].

Loop E. Proposed Loop E would lie within the Colorado Plateau region and would traverse predominantly very deep and deep soils of undulating upland plains. Shallow soils are less predominant and occur in rocky, rough, and broken terrain. Susceptibility to water erosion for the identified soils is mostly low to moderate but ranges to high. Wind erosion potential is mostly moderate. Reclamation potential ranges from good to poor but mostly fair to poor. Shallow soils, salinity, clayey and sandy textures are the primary factors responsible for the rating of poor [BLM, 1975a; Maker et al., 1978; SCS 1975a].

Loop F. Proposed Loop F would lie within the Colorado Plateau region and would traverse predominantly deep soils of undulating uplands and alluvial floodplains. Shallow soils are less predominant and occur in rocky, rough, and broken terrain of mesa tops and cinder cones. Susceptibility to water erosion is mostly low with moderate to with high potential on steeper slopes. Wind erosion potential is mostly moderate but ranges from low to moderate. Reclamation potential is evenly distributed from good to poor. Shallow soils, and stony or clayey textures are the primary factors responsible for the rating of poor [Jorgensen, 1986; Robertson, 1986; SCS, 1983; FS, 1986a].

Loop G. Proposed Loop G would lie within the Colorado Plateau region and would traverse predominantly deep soils of undulating uplands and alluvial bottoms. Shallow soils are less common and occur in rocky, rough, and broken terrain. Susceptibility to water erosion for the identified soils ranges from low to moderate. Wind erosion potential is mostly low but ranges to moderate. Reclamation potential is mostly fair but ranges from poor to good. Shallow soils and gravelly, cobbly to stony textures are the primary factors responsible for a rating of poor [Jorgensen, 1986; Robertson, 1986; SCS, 1983; FS, 1986a].

Loop H. Proposed Loop H would lie within the Colorado Plateau region and would traverse predominantly moderately deep to deep soils of plains and mesas. Shallow soils are less common and occur in rocky, rough, and broken terrain and mesa sideslopes. Susceptibility to water erosion is mostly low but ranges from low to high with the higher potential on steeper slopes. Wind erosion potential is mostly low to moderate. Reclamation potential ranges from poor to good but is mostly poor. Shallow soils and gravelly, cobbly, and clayey textures are the primary factors responsible for the rating of poor [BLM, 1979; SCS, 1969; SCS, 1976c].

Loop I. Proposed Loop I would lie within the Basin and Range region and would traverse predominantly shallow soils of hills, mesas, and mesa sideslopes. Very deep, loamy soils are less common and occur on alluvial fans and terraces. Susceptibility to water erosion is mostly low but ranges from low to high with the higher potential on steeper slopes. Wind erosion potential is mostly low and moderate. Reclamation potential is mostly poor with some areas with good potential. Shallow soils and cobbly and sandy textures are the primary factors responsible for the rating of poor [BLM, 1979].

3.7.4 Surface Water

The proposed expansion project would involve construction in several major USGS-designated drainage basins including the Pecos, Rio Grande, Little Colorado and Colorado Rivers in Texas, New Mexico, and Arizona.

The majority of the route of the proposed expansion would traverse areas which are characterized as being primarily semiarid. Consequently, the predominant flow regime of the streams along the proposed project is ephemeral to intermittent. When flows do occur in the ephemeral and intermittent channels, they usually are in response to high-intensity and short-duration convective thundershowers. The flows can be of very large discharge in the form of flash floods covering wide arroyos and washes. Typically extensive periods of no flow may occur.

The description of the general character of surface water resources presented in Section 3.6.1.4 applies to this proposal. Table 3.7-3 summarizes the major intermittent stream channels crossed and milepost of crossing.

Table 3.7-3

MAJOR INTERMITTENT DRAINAGE CHANNELS, TRANSWESTERN EXPANSION PROPOSAL

River Basin	Loop	Drainage Channel	Milepost
		West Texas Lateral	
Pecos River	1	Monument Draw	3.7
	2	None	-
		Mainline	
	A	Middle Arroyo	29.8
	A	Arroyo del Macho	40.0
	A	Hasperos Canyon	45.9
	A	Hasperos Canyon	48.4
	A	Little Hasperos Canyon	55.2
Rio Grande	B	Pinatosa Canyon	90.0
	B	Sacate Draw	91.4
	B	North Canyon	109.2
	B	Arroyo Seco	116.5
	B	Canyon Cueva	120.0
	C	Arroyo Garcia	181.4
	C	Arroyo Lucero	185.7
	C	Arroyo Colorado	189.7
	C	Wild Celery Creek	199.6
	C	Rio Gypsum	200.5
	D	Grants Canyon	228.9
	D	San Mateo Creek	235.0
	D	Mitchell Draw	245.1
	D	Mitchell Draw	255.3
Colorado River	E	Defiance Draw	304.9
	E	Black Creek	312.9
	E	Wide Ruin Wash	338.2
	F	Coyote Wash	382.8
	F	Coyote Wash	401.2
	G	Weatherford Canyon	460.1
	G	Upper Schultz Creek	462.7
	H	Railroad Canyon	537.7
	H	Big Chino Wash	542.4
	H	Markham Wash	550.7
	H	Lookout Wash	567.9
	H	Lookout Wash	572.5
	H	Tuckayou Wash	573.2
	H	Willow Creek	577.5
	I	Sacramento Wash	620.3
	I	Secret Pass Wash	621.0
	I	Silver Creek	630.4

Loops 1, 2, A, B, C, F, and H. These loops would intersect ephemeral and intermittent drainages only. No significant surface water resources occur along these proposed loop segments. However, the proposed route does cross an underground aqueduct on Loop 1.

Loop D. Approximately 12 ephemeral and four intermittent drainages would be crossed by this loop. The loop would parallel the Rio San Jose, a major intermittent drainage, at a distance of one-half mile for about two miles east of Grants, New Mexico. A small portion of the loop segment near its western terminus would also parallel the South Fork of the Rio Puerco, a perennial drainage, near Gallup, New Mexico. The Rio Puerco drains into the Colorado River basin in Arizona. The demand for water resources in this area is high and therefore, this perennial water source is variously utilized.

Loop E. This loop would cross approximately 21 ephemeral and three intermittent drainages. Of particular note is Black Creek, south of Saint Michael's, Arizona, which is one of the only gauged streams that would be crossed by the expansion project. Although Black Creek is intermittent, it has an average discharge of 8.26 cfs and a maximum discharge of 7,680 cfs. Several small diversions for agricultural use exist along the creek.

Loop G. Approximately 22 ephemeral and five intermittent drainages would be crossed by this loop. Many of these intermittent drainages are fed by perennial springs including Orion, Little Leroux, Taylor, Maxwell, Moore, Walker Hill and N.E. Springs. The quality of these surface waters is significantly better than along other portions of the proposed expansion project. These surface water resources are important to aquatic species as well as wildlife and range stock.

Loop I. Approximately three ephemeral and three intermittent drainages would be crossed by this loop segment. Sacramento and Secret Pass Washes are located in the Sacramento Valley where a limited amount of irrigated agriculture takes place. Consequently, some agricultural return flow may contribute significant additional flow in these washes. Several springs including Twin, Indian, Onetto, and other unnamed springs occur in close proximity to the proposed loop in the Black Mountains where Silver Creek arises.

3.7.5 Groundwater

Existing groundwater conditions along the Transwestern Expansion are summarized in Table 3.7-4. A locally high water table may exist along major intermittent and perennial streams. See Section 3.7.4 for a description of streams which may have saturated alluvium associated. Groundwater quality in the vicinity of the proposed loops varies from good to poor. Shallow groundwater is generally of poor quality along the proposed

Table 3.7-4

GENERAL GROUNDWATER CHARACTERISTICS, TRANSWESTERN EXPANSION PROPOSAL

Loop Number	Minimum Depth to Water (ft)	Total Dissolved Solids Concentration (mg/l)	Degree of Groundwater Development	References	Comments
1	80-120	500-1000	Moderate	Garza & Wesselman [1962] Richey et al. [1985]	No major springs
2	<30	>2000	Low	Richey et al. [1985]	No major springs
A	100-500	1000-3000	Low	Kelly [1974] West and Broadhurst [1975]	No major springs
B	100-500 (except near Scholls, NM where depth <30)	1000-2000	Low	Brady et al. [1984a] Brady et al. [1984b] Thompson et al. [1984a]	No major springs
C	40-100	>2000	Low	Dinwiddie and Motts [1964]	No major springs
D	40-100	>2000	Low	Dinwiddie and Motts [1964]	No major springs
E	200-500	<1000	Low	Davidson [1979]	No major springs
F	>500 (except at western end, where depth is 200-500)	>3000	Low	Davidson [1979]	No major springs
G	>500	<1000	Moderate	Davidson [1979]	Numerous springs
H	350-700	<500	Low	Bedinger et al. [1984] Langer et al. [1984] Thompson et al. [1984b]	No major springs
I	>500 in Sacramento Valley <30 in Black Mtns Mtn. and Mojave Valley	<500 (except at western end, where TDS is 500-1000)	Moderate	Bedinger et al. [1984] Langer et al. [1984] Thompson et al. [1984a]	Springs of moderate local importance occur in the Black Mtns.

loops. Higher quality groundwater generally occurs at 100 feet or greater below the surface. Springs issue from bedrock along Loop I in the Black Mountains area.

3.7.6 Freshwater Biology

Loops 1, A, B, C, D, F, G, H, and I. No perennial streams would be crossed and no significant perennial habitats occur in the vicinity of the proposed loops. However, several intermittent drainages would be traversed, as noted in Section 3.7.4. Some ephemeral habitats may be present during wet periods which support certain algal, crustacean, insect and other taxa with life cycles adapted to temporary ponds.

Loop 2. No perennial streams would be crossed and no significant perennial habitats occur in the vicinity of Loop 2. However, two intermittent drainages would be crossed. An ephemeral lake is present between MP 84.7-85.7. The lake is in a playa basin which occasionally floods, supporting short-lived opportunistic or drought-adapted species capable of utilizing temporary aquatic environments.

Loop E. One perennial and twelve intermittent streams would be crossed by Loop E. The one perennial stream that would be crossed is Black Creek in Apache County, Arizona. Black Creek may support a limited population of nongame fish but does not contain any game species [Diswood, 1986]. No fisheries are present in any of the intermittent washes that would be crossed by Loop E. Ephemeral aquatic habitats may exist after rainy periods which support opportunistic species with short life cycles or adaptations for temporary habitats such as some algae, crustaceans, and insects.

The state of New Mexico lists a rare diving beetle, Dytiscidae hygrotus semivittatus, as occurring within three miles of the proposed pipeline ROW of Loop D in McKinley County. Only three known populations of this beetle occur in the state with the nearest known populations outside the state occurring in Alberta, Canada. The beetle is found in ephemeral ponds and is highly mobile. Legal status in New Mexico is rare (scattered) and it is unprotected [New Mexico Dept. of Natural Resources, 1986]. Due to the ability of adult dytiscids to migrate by flight, other populations may occur in similar ephemeral habitats in the area. Two federally listed fish species, the blunt nose shiner (Notropus simus) and the Pecos gambusia (~~Gambosia~~ Gambusia nobilis) potentially occur within the overall study area in the Pecos River and the Rio Grande. No loops, however, cross these two drainages and no known populations occur along the proposed loops.

3.7.7 Terrestrial Biology

3.7.7.1 Vegetation

The Transwestern Expansion Proposal would traverse a large variety of habitats distributed in three distinct geographic regions. Accordingly, a wide array of vegetation community types occur along the proposed loop segments. These types include the Chihuahuan creosote bush scrub, semi-desert grassland, plains grassland, malpais, sagebrush scrub, pinyon-juniper woodland, ponderosa pine woodland, agricultural land, and Mojavean creosote bush scrub. Narrow zones of riparian vegetation may be included in these types along streams. Descriptions of these community types are presented in Appendix B. Table 3.7-5 lists the vegetation community types that occur along the proposed route of the loops and the mileposts at which they occur.

Table 3.7-5

VEGETATION COMMUNITY TYPES,
TRANSWESTERN EXPANSION PROPOSAL

Loop	Geographic Region	Vegetation type	Milepost
West Texas Lateral			
1	Great Plains	Chihuahuan creosote bush scrub	0-4.1
2		Semidesert grassland	77.5-88.0
Transwestern Mainline			
A	Great Plains	Plains grassland	29.0-55.0
B	Basin and Range	Pinyon-juniper woodland	86.6-94.0
		Plains grassland	94.0-103.0
		Agricultural land	103.0-105.0
		Plains grassland	105.0-131.3
C	Colorado Plateau	Semidesert grassland	173.3-180.0
		Plains grassland	180.0-200.5
D		Plains grassland	224.0-229.0
		Pinyon-juniper woodland	229.0-231.0
		Plains grassland	231.0-241.0
		Malpais	241.0-244.0
		Pinyon-juniper woodland	244.0-265.0
		Sagebrush scrub	265.0-271.3

Table 3.7-5 (continued)

VEGETATION COMMUNITY TYPES,
TRANSWESTERN EXPANSION PROPOSAL

Loop	Geographic Region	Vegetation type	Milepost
E	Colorado Plateau	Pinyon-juniper woodland	303.3-311.0
		Plains grassland	311.0-315.0
		Pinyon-juniper woodland	315.0-324.0
		Ponderosa pine woodland	324.0-333.0
		Pinyon-juniper woodland	333.0-340.8
F		Pinyon-juniper woodland	375.3-376.0
		Plains grassland	376.0-387.0
		Sagebrush scrub	387.0-402.0
		Plains grassland	402.0-409.0
		Sagebrush scrub	409.0-416.8
G		Pinyon-juniper woodland	449.0-450.0
		Ponderosa pine woodland	450.0-478.0
		Plains grassland	478.0-479.0
		Agricultural land	479.0-480.0
		Plains grassland	480.0-482.0
		Ponderosa pine woodland	482.0-485.5
H		Pinyon-juniper woodland	526.8-530.0
		Plains grassland	530.0-544.0
		Pinyon-juniper woodland	544.0-552.0
		Plains grassland	552.0-560.0
		Pinyon-juniper woodland	560.0-572.0
		Agricultural land	572.0-574.0
		Pinyon-juniper woodland	574.0-576.3
I	Mojave Desert	Mojavean creosote bush scrub	613.0-616.0
		Agricultural land	616.0-618.0
		Mojavean creosote bush scrub	618.0-635.0
		Agricultural land	635.0-637.0
		Mojavean creosote bush scrub	637.0-644.5

A variety of distinct habitats may be exploited by plants with very limited distributions and are consequently rare. Appendix C lists the plant species that are of special concern, their status and associated habitats, and the loops on ~~mileposts at~~ which they may occur. This list includes those species itemized by the U.S. Fish and Wildlife Service that have a reasonable potential of occurring in the vicinity of the pipeline routes, as well as additional species believed to have a potential of occurring. Table 3.7-6 lists the species of greatest concern that may occur along the Transwestern Expansion Proposal. These species are federally protected. Field surveys were conducted for these species by qualified field botanists during June and July 1986. ~~along the proposed pipeline routes.~~ The results of the survey are presented in Environmental Consequences.

Table 3.7-6

LEGALLY PROTECTED PLANT SPECIES,
TRANSWESTERN EXPANSION PROPOSAL

Species	Status [1]	Loop(s)
Gypsum wild buckwheat	LT	2
Kuenzler's hedgehog cactus	LE	A
Zuni (or Rhizome) fleabane	LT	D
Peebles Navajo cactus	LE	E,F
Arizona cliffrose	LE	H

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[1] Status: LT - federally listed threatened, LE - federally listed endangered

Loop 1. This proposed loop would traverse the Chihuahaun desert portion of the Great Plains geographic region near Pyote, Texas. The vegetation type that the loop would cross is a Chihuahuan creosote bush scrub. The proposed loop would traverse areas that may contain two federal candidate plant species as itemized in Appendix C.

Loop 2. This proposed loop would traverse the Great Plains geographic region near Roswell, New Mexico. The vegetation type that would be crossed along the entire loop is semidesert grassland. One federally listed threatened species, Gypsum wild buckwheat, and two federal candidate species, one of which is also listed as endangered by the State of New Mexico, dune unicorn plant, may occur in areas that would be traversed by this loop. Gypsum wild buckwheat grows on gypsiferous soils in gramma grassland communities. ~~Although the nearest known location for Gypsum wild buckwheat is 35 miles west of the loop, the physiographic and geologic setting may be conducive for the presence of the species.~~

Loop A. This loop would traverse the western edge of the Great Plains geographic region northwest of Roswell, New Mexico. Plains grassland occurs along the entire length of the proposed loop expansion. One federally listed endangered species, Kuenzler's hedgehog cactus, two federal candidates, and one State of New Mexico sensitive species may occur in areas that would be traversed by the proposed loop. Habitat for the federally endangered hedgehog cactus is provided by limestone ledges and rock outcrops at about 6000 feet elevation ~~and grows~~ in the pinyon-juniper woodland vegetation type.

Loop B. This proposed loop would traverse the Basin and Range geographic region. The proposed Loop B expansion would cross three vegetation types including plains grassland, agricultural land, and pinyon-juniper woodland. One State of New Mexico endangered species, Wright's fishhook cactus, and five federal candidates, four of which are state sensitive species, may occur in areas that would be traversed by the proposed loop as itemized in Appendix C.

Loop C. This proposed loop would lie within the Colorado Plateau geographic region. Vegetation types which would be traversed by the proposed Loop C expansion include semidesert grassland and plains grassland. Five ~~federal candidate species, four of which are~~ New Mexico state sensitive species, four of which are federal candidate species, and ~~two~~ one additional ~~State of~~ New Mexico ~~sensitive~~ endangered species may occur in areas that would be traversed by the proposed loop as itemized in Appendix C.

Loop D. This proposed loop would lie within the Colorado Plateau geographic region. Four vegetation types would be traversed by the proposed Loop D expansion: plains grassland, pinyon-juniper woodland, malpais and sagebrush scrub. One federally listed threatened species, Zuni fleabane (also State of New Mexico endangered), one federal candidate, one additional State of New Mexico endangered species, Wright's fishhook cactus, and five State of New Mexico sensitive species may occur in areas that would be traversed by the proposed loop. Zuni fleabane potentially inhabits sandstone slopes and clay banks of the Chinle formation that would be traversed by the loop.

Loop E. This proposed loop would lie within the Colorado Plateau geographic region. Three vegetation types occur along this proposed segment of the route, including plains grassland, pinyon-juniper woodland and ponderosa pine woodland. ~~Peebles Navajo cactus, a federally listed endangered species, may occur in areas that would be traversed by the proposed loop. It grows in a harsh environment of arid gravelly hills on the Shinarump Conglomerate member of the Chinle Formation within the plains grassland vegetation type.~~

Loop F. This proposed loop would lie within the Colorado Plateau geographic region. Three vegetation types occur along this proposed loop: pinyon-juniper woodland, plains grassland, and sagebrush scrub. ~~One federally listed endangered species, Peebles Navajo cactus, and~~ One federal candidate species is known to occur in areas that would be crossed by the proposed loop.

Loop G. This proposed loop would lie within the Colorado Plateau geographic region. Four vegetation types would be traversed by this proposed segment of the route including pinyon-juniper woodland, ponderosa pine woodland, agricultural land, and plains grassland. Ten federal candidate species including five species considered sensitive by the U.S. Forest Service may occur in areas that would be traversed by the proposed loop as itemized in Appendix C.

Loop H. This proposed loop would lie within the Colorado Plateau geographic region. Three vegetation types including pinyon-juniper woodland, agricultural land, and plains grassland, occur along this proposed section of the route. One federally listed endangered species, Arizona cliffrose, and one federal candidate species may occur in the area that would be traversed by the proposed loop. Arizona cliffrose may occur on clay loam soils over limestone or tuffaceous deposits on rolling hills at about 3,500 feet elevation.

Loop I. This proposed loop would lie within the Mojave Desert geographic region. Two vegetation types occur along the proposed loop including Mojavean creosote bush scrub and agricultural land. One federal candidate species may occur in areas that would be traversed by the loop.

3.7.7.2 Wildlife

A diversity of plant communities, topography, and the remote nature of the proposed loop expansions along the Transwestern pipeline provide habitat for a wide array of wildlife species. Specific habitats provided by different community types are generally exploited by a characteristic assemblage of wildlife species. Most of the species within these groups are widely distributed in the southwestern United States and occur discontinuously along the pipeline route where appropriate habitat exists.

These animals and the communities in which they occur along the proposed loop expansions are discussed below. Descriptions of species assemblages for each community type are based on published literature, data files of state and federal agencies, communication with professional personnel familiar with the areas of concern and reconnaissance surveys.

Many locally important wildlife features occur along the proposed pipeline expansion. These include livestock/wildlife water tanks and springs, wildlife movement corridors, heavily vegetated or riparian areas along major drainages, and specific habitats identified by resource management agencies. All wildlife features are discussed in this section except for the riparian habitat, which is described in 3.7.7.1. Important wildlife features that occur along the proposed expansion are presented in Table 3.7-7.

Table 3.7-7

IMPORTANT WILDLIFE HABITAT FEATURES,
TRANSWESTERN EXPANSION PROPOSAL

Loop	Milepost	Wildlife Feature
2	79.3	Water Tank
B	87.0-90.0	Critical Mule Deer Habitat
	88.9-90.3	Critical Mule Deer Habitat
	91.3-91.5	Critical Mule Deer Habitat
	95.0	Water Tank
	110.5	Water Tank
	112.3	Water Tank
	131.5	Spring
G	456.7	Water Tank
	456.8	Water Tank
	458.8	Water Tank
	459.6	Water Tank
	461.5	Water Tank
	462.0-463.0	Pair of Spotted Owls
	462.4	Water Tank and Spring
	464.7	Pair of Spotted Owls
	468.5	Water Tank
	469.7	Spring
	472.4-477.8	Deer Fawning Area
	~~472.4-474.2~~	~~Deer Fawning Area~~
	472.5	Water Tank and Spring
	472.9	Spring and Water Tank
	475.7	Water Tank
	477.4	Water Tank
	477.0-477.8	Elk Meadow
	479.5	Spring
	479.8	Water Tank
	480.2	Water Tank
	480.6	Water Tank
	483.3	Spring
H	526.5-537.5	High Value Pronghorn Habitat
	526.5-537.5	High Value Prairie Dog Habitat
	537.5-543.8	High Value Mule Deer Habitat
	537.5-543.8	High Value Javelina Habitat
	543.8-551.3	High Value Pronghorn Habitat
	543.8-551.3	High Value Prairie Dog Habitat
	551.3-576.0	High Value Mule Deer Habitat
	551.3-576.0	High Value Javelina Habitat

Table 3.7-8 lists the wildlife species of special concern, their status, associated habitats and proposed loops on which they potentially occur. Specific locations have been excluded to avoid harassment of sensitive species and their habitats.

Table 3.7-8

WILDLIFE SPECIES OF SPECIAL CONCERN, TRANSWESTERN EXPANSION PROPOSAL

Species	Status[1]	Habitat	Loop(s)
Bald Eagle	E	Waterways and migration corridors	All loops
Peregrine falcon	E	Cliff areas for nesting all types for movement and foraging	All loops
Black-footed ferret	E	Grasslands with prairie dog colonies	B,C,D,E, F,G,H
Whooping crane	E	Migration corridor along the Rio Grande	B,C
Interior least tern	E	Bitterlake NWR and surrounding areas where water is available	2,A
Swainson's hawk	C	Grassland and open woodland	B,C,D,E, F,G,H
Ferruginous hawk	C	Open grasslands	2,A,B,C, D,F,H
Mountain plover	C	Short grass prairies	C,D,E,F,G
Bell's vireo	C	Riparian areas and brushy arroyos	2
Southern spotted owl	C	Ponderosa pine forest	G
Dune sagebrush lizard	C	Sand dunes	2
Gila monster	C	Mojave desert	I
Desert tortoise	AZ-3	Mojave desert	I
Desert bighorn sheep	AZ-3	Mojave desert	I
Baird's sparrow	NM	Grasslands	2
McCown's longspur	NM	Grasslands	2
Trans-Pecos rat snake	NM	Grasslands	2
Gray Vireo	NM	Grasslands	D

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[1] E = Federally listed endangered species; C = Federal candidate for listing; AZ-3 = State of Arizona Category 3; NM = Listed as Group 2 endangered by the State of New Mexico.

Loop 1. Wildlife occurring along Loop 1 is characteristic of the Chihuahuan creosote scrub community. Common reptile species that may occur include the desert spiny lizard, side blotched lizard, crevice spiny lizard, eastern fence lizard, gopher snake, and western diamondback rattlesnake. Avian species that are characteristic of the community include the turkey vulture, red-tailed hawk, American kestrel, common raven, loggerhead shrike, northern mockingbird, brown towhee, crissal thrasher and Gambel's quail. Common mammals include desert pocket mouse, rock pocket mouse, Merriam's kangaroo rat, cactus mouse, southern plains woodrat, spotted ground squirrel, rock squirrel, black-tailed jackrabbit, desert cottontail, kit fox and coyote [MacMahon, 1985; ERT, 1984].

Three species of birds that may occur along Loop 1 are of federal and state concern. These include the bald eagle, peregrine falcon, and Swainson's hawk. The bald eagle and peregrine falcon, both listed as federally endangered, may occasionally occur in the area of Loop 1, particularly during migration. The Swainson's hawk, classified as a federal candidate species (category 2), is a year-round resident of the area. At present, no active nest sites have been identified within the area of concern.

Loop 2. Wildlife along Loop 2 reflects the transitional nature of the communities involved. Representative species from the Chihuahuan creosote scrub and plains grassland communities may be found along this loop. A majority of the reptiles, birds and mammals that occur in the Chihuahuan creosote scrub along Loop 1 also occur on Loop 2. Other species more characteristic of grasslands also occur and include the spotted whiptail lizard, ground snake, black-headed snake, horned lark, western meadowlark, lesser prairie chicken, prairie falcon, hispid pocket mouse, southern grasshopper mouse, spotted ground squirrel, badger, swift fox, pronghorn antelope and mule deer [Findley et al., 1975; Stebbins, 1966].

One water tank occurs within the area of concern. Free water sources are often a restricted resource in such arid environments, and consequently tend to concentrate individuals and species at a discrete locality.

The bald eagle, peregrine falcon and interior least tern, all federally listed as endangered, may occur in the vicinity of the proposed loop during migration. The Bell's vireo, Swainson's hawk and dune sagebrush lizard, all federal candidate species, may also occur in the area. Presently, no active nests or lizard populations for the above species of concern have been identified within the area of concern. Species listed by the State of New Mexico as Group 2 endangered that may be present along the proposed loop are the Baird's sparrow and McCown's longspur. The Trans-Pecos rat snake, also a state Group 2 species, has been sighted in the area near draws, but no specific location data are available [Juen, 1986].

Loop A. Characteristic wildlife species occurring along proposed Loop A are similar to those listed for Loop 2. Major drainages along the proposed loop, including Middle Arroyo, Arroyo del Macho and Hasperos Canyon, are concentration areas for several wildlife species including mule deer, pronghorn antelope and many passerines. Game species census work done by the BLM in the Macho Wildlife Habitat Area, which is traversed by the proposed loop, estimates the antelope population in the area at around 300 to 400 animals; scaled quail and mourning dove are estimated at about 40 and 148 birds per square mile, respectively [Juen, 1986].

Wildlife species listed as endangered, threatened or candidates are the same as described for Loop 2, with the exception of Bell's vireo and the dune sagebrush lizard, which do not occur along proposed Loop A.

Loop B. Wildlife species occurring along proposed Loop B are characteristic of plains grassland and pinyon-juniper woodland communities. The plains grassland along Loop B supports similar species as listed for plains grassland on Loop 2. The pinyon-juniper woodland community along the proposed loop provides additional habitat for other species of birds including Cooper's hawk, sharp-shinned hawk, great horned owl, ladderback woodpecker, common flicker, common nighthawk, gray flycatcher and green-tailed towhee.

The proposed loop crosses approximately three miles of New Mexico critical mule deer winter habitat [Gonzales, 1986].

Three water tanks and one natural spring occur within the proposed ROW. As previously discussed, free water sources are often a restricted resource in arid environments, and consequently tend to concentrate individuals and species at discrete localities.

Federally listed endangered species that may occur along portions of proposed Loop B include the bald eagle, peregrine falcon and whooping crane. These species may occur along the proposed loop during migration. Additionally, there is some concern that potential habitat (prairie dog colonies) for the federally endangered black-footed ferret may exist within one half mile of some portions of the proposed loop. During aerial reconnaissance of the proposed loop expansion by BIO/WEST in March 1986, no prairie dog colonies were observed in the immediate vicinity of the pipeline ROW. The ferruginous and Swainson's hawks, federal candidate species, may nest within one half mile of the proposed loop. No active nests sites are currently known for the area of concern. No state species of concern have been noted by New Mexico along the proposed loop [NMDGF, 1985].

Loop C. Wildlife occurring along the proposed Loop C expansion are typical of the semidesert and plains grassland communities previously described. A herd of approximately 40 pronghorn antelope occur along this proposed loop [Louis, 1986]. No designated crucial pronghorn habitat is crossed by the proposed loop.

The federal and state species of concern are the same as those noted for Loop B. Cliff areas along ~~the northern five miles of~~ the proposed loop provide potential nesting habitat for peregrine falcons. No aeyries are known to exist within the area of concern. Densities of prairie dogs in Valencia County, New Mexico, which is traversed by the proposed loop, are among the highest in New Mexico [NMGF, 1984]. However, no prairie dog colonies were observed along the pipeline ROW during an aerial reconnaissance conducted by BIO/WEST during March of 1986. Mountain plovers potentially nest within the short grass prairielands.

Loop D. Plains grassland and pinyon-juniper woodland communities along proposed Loop D provide habitat for wildlife species similar to those previously listed in those habitat types. Wildlife species supported by the sagebrush scrub community include the sagebrush lizard, western yellowbelly racer, sage thrasher, sage sparrow, Great Basin pocket mouse, Ord's kangaroo rat, least chipmunk, Townsend's ground squirrel, badger, kit fox and bobcat [Findley et al., 1975; Stebbins, 1966].

Federally listed and candidate species include those listed for Loops B and C with the exception of the whooping crane, which does not occur along this proposed loop. The gray vireo, listed as a New Mexico state species of concern [NMDGF, 1985], uses the area for summer habitat. Cliff areas adjacent to the proposed loop provide potential nesting habitat for peregrine falcons. No nests have currently been identified within the area of concern.

Loop E. Habitat provided by the three community types along proposed Loop E supports a large diversity of wildlife. Wildlife species occurring in the plains grassland and pinyon-juniper woodland communities along this proposed loop are similar to those previously described for these habitat types.

Characteristic species of the ponderosa pine woodland include Merriam's turkey, goshawk, hairy woodpecker, long-earred owl, pine grosbeak, pine siskin, Merriam's shrew, vagrant shrew, least chipmunk, red squirrel, Abert's squirrel, long-tailed weasel and elk.

Species of special concern found along Loop E are identical to those found on Loop D with the exception of the gray vireo, which does not occur along this alignment. No nests or viable populations of species of special concern have currently been identified within the area of concern.

Loop F. Characteristic wildlife species occurring along this proposed loop are similar to species previously described for the pinyon-juniper woodland, plains grassland and sagebrush scrub community types.

Federally listed species that may occur along portions of Loop F are the bald eagle and peregrine falcon. The bald eagle may occur as a migrant. No suitable nesting habitat for the peregrine falcon has been identified within the area of concern. Prairie dog colonies potentially occur along this loop within the grassland habitats. Viable colonies provide suitable black-footed ferret habitat. No active towns have currently been identified along this loop. The ferruginous and Swainson's hawks, and mountain plover, federal candidate species, potentially nest along this alignment. At present no nests have been identified within the area of concern.

Loop G. Plains grassland, ponderosa pine woodland and pinyon-juniper woodland habitats along proposed Loop G support wildlife species similar to those previously described for each of the community types.

~~Three~~ Twelve water tanks and ~~three~~ four natural springs occur ~~along~~ within one-half mile of this alignment. Free water sources are often a restricted resource in arid environments, and consequently tend to concentrate individuals and species at discrete localities.

This proposed loop crosses approximately two miles of deer fawning habitat and 3/4 mile of elk meadow.

Federally listed species that may occur in the area of the proposed loop expansion include the bald eagle, peregrine falcon, and black-footed ferret. The bald eagle ~~may~~ occurs as a migrant during winter. No suitable nesting habitat for the peregrine falcon has been identified within the area of concern. Prairie dog colonies potentially occur within the grassland community crossed by the proposed loop. Viable prairie dog towns provide suitable habitat for ferrets. At present, no active towns have been identified along this loop. At MP 462-463 the loop bisects the known range of a pair of Southern spotted owls (Strix occidentalis lucida), which have been radio-tagged by personnel of the Department of Biological Sciences, Northern Arizona University. The same biologists indicated that the range of another pair of Southern spotted owls approaches the loop, within 200 yards, at MP 467.7. The Swainson's hawk and the southern spotted owl are candidate species potentially nesting along the proposed route [AGFD, 1986]. The Swainson's hawk is associated with open grassland/woodland communities, while the southern spotted owl generally prefers deep, narrow, timbered canyons at elevations from 6500 to 9000 feet [Zarn, 1974]. The mountain plover potentially nests within the grasslands along this loop.

Loop H. Pinyon-juniper woodland and plains grassland habitat along the proposed Loop H expansion support similar wildlife species as previously described for these communities.

The proposed loop crosses approximately 18 miles of high value pronghorn antelope habitat, and 31 miles of high value mule deer and javelina habitat [Ferrell, 1986]. Small game species include Gambel's quail, cottontail rabbits and mourning doves [Ferrell, 1986].

The bald eagle and peregrine falcon, federally listed endangered species, may occur on portions of the proposed loop mainly as temporary visitors, although approximately nine miles of suitable peregrine nesting habitat is crossed by the alignment. The proposed loop crosses approximately 11 miles of suitable prairie dog habitat. Significant viable colonies have been identified within this segment [Ferrell, 1986]. Active prairie dog colonies provide potential habitat for the federally endangered black-footed ferret. Prairie dog colonies also provide a significant prey source and/or shelter for such predators as badgers, gray foxes, kit foxes, coyotes, golden eagles, rough-legged hawks, Swainson's hawks, ferruginous hawks, red-tailed hawks, prairie falcons, and burrowing owls.

Loop I. Habitat provided by the Mohave creosote scrub community supports a diversity of wildlife species commonly associated with the Mojave desert. Characteristic reptiles include the desert iguana, zebratail lizard, western whiptail, chuckwalla, red coachwhip, sidewinder, and Mohave rattlesnake. Bird species occurring within this habitat type include Gambel's quail, mourning dove, white-winged dove, cactus wren, Le Conte's thrasher, black-throated sparrow, sage sparrow and Brewer's sparrow. Characteristic mammals include mule deer, desert bighorn sheep, the desert shrew, desert kangaroo rat, cactus mouse, white-tailed antelope squirrel, black-tailed jackrabbit, desert cottontail and coyote [MacMahon, 1985].

Federally endangered species that may occur along or near proposed Loop I include the bald eagle and peregrine falcon. Bald eagles and peregrine falcons are winter visitors and migrants along the Colorado River, and may occasionally range inland over the proposed loop. Additionally, the portion of the Black Mountains that would be traversed by the loop has been identified as potential habitat for the peregrine falcon [BLM, 1986].

The desert bighorn sheep, a State of Arizona Category 3 species, occurs along the proposed pipeline in the vicinity of the Black Mountains [Ferrell, 1986]. A high-value bighorn habitat occurs within one-half mile of the pipeline ROW and a lambing ground occurs one mile away. This state listing indicates concern exists for the species, but that not enough biological information is available to take further action. Desert bighorn sheep habitat in this area is classified endangered by the Arizona Game and Fish Department due to human disturbance [Ferrell, 1986].

The Gila monster is a federal candidate species occurring within the Mojave Desert. It is an uncommon species of sporadic distribution. No concentrations or sensitive habitat has been delineated along the proposed loop.

The desert tortoise is listed as a federal candidate and classified by Arizona Game and Fish Department as Category 3. This species occurs throughout western Arizona, although populations are patchy and island-like [Schwable, 1986]. They are primarily found in rocky crevices, washes and other broken rocky terrain [Schwable, 1986]. Approximately 40 percent of desert tortoise habitat in Arizona has presently been surveyed, and results indicate that, where present, populations range from 25 to 400 per square mile [Schwable, 1986]. Tortoise populations within Arizona have been designated by Arizona Game and Fish Department as low (<25 tortoise/mi^2), medium (25-50 tortoise/mi^2) and high (>50 tortoise/mi^2) densities [Schwable, 1986]. Most of the currently surveyed populations within the state fall within the medium density class [Schwable, 1986]. Approximately 15 miles of this proposed loop lies within potential tortoise habitat; however, no discrete populations have been delineated for the area of concern.

3.7.7.3 Grazing

The Transwestern Expansion Proposal would traverse a wide array of grazing allotments and lands with federal, state, and private ownership. The following narrative very briefly describes each allotment along the proposed route. Appendix D provides more detailed information for the allotments on each loop. For reasons previously discussed, grazing information for state parcels are not included in this appendix. Where grazing units (allotments) are not delineated on Bureau of Indian Affairs land and open range exists, AUM's (animal unit months) are not accurately documented. Therefore, only an estimate of acres per AUM is given.

Loop 1. This loop would intersect only state and private land for which grazing information is not available.

Loop 2. This loop would intersect four livestock grazing allotments located southwest of Hobbs, New Mexico. These BLM allotments range in size from 4,536 to 12,216 acres. All allotments in the area are permanent, with cattle as the predominant livestock type.

Loop A. This loop would intersect eight BLM grazing allotments. These allotments, ranging in size from 5,120 to 69,488 acres, are located northwest of Roswell, New Mexico. Sheep, cattle and horses utilize these permanent allotments on a year-long basis. The pipeline also intersects a small parcel of private land for which grazing information is not available.

Loop B. The majority of the land that would be intersected by Loop B is under state and private jurisdiction. Grazing information for these areas is not available. Two permanent BLM allotments would also be intersected by the proposed loop. These allotments, ranging in size from 3,450 to 7,238 acres, are located northeast of Socorro, New Mexico. Cattle are the primary livestock present in the area.

Loop C. Most of the land available for livestock grazing along Loop C (15 miles) falls under the jurisdiction of the Laguna Indian Reservation. Two grazing units, ranging in size from 9,960 to 99,609 acres, as well as a large area of open range would be intersected by the pipeline. Cattle, sheep, and horses constitute the livestock types on the reservation. A small portion (one mile) of private land, for which grazing information is not available, would also be traversed by the pipeline.

Loop D. This loop would intersect six permanent BLM allotments located north of Grants, New Mexico. These allotments, utilized primarily by cattle, range from 920 to 7,890 acres in size. Two small segments of private land, for which grazing information is not available, would also be intersected by the pipeline.

Loop E. All of the land that would be intersected by Loop E is under the jurisdiction of the Navajo Indian Reservation. Grazing unit, acreage, and AUM information are not available for the area.

Loop F. All of the land that would be intersected by Loop F is under the jurisdiction of the Navajo Indian Reservation. Grazing unit, acreage, and AUM information are not available for the area.

Loop G. This loop would intersect nine permanent USFS allotments ranging in size from 4,906 to 66,401 acres. These allotments, utilized by cattle, are located north of Flagstaff, Arizona.

Loop H. This loop would intersect only private and state lands for which grazing information is not available.

Loop I. This loop would intersect three BLM allotments located north of Kingman, Arizona. These allotments range in size from 22,229 to 86,430 acres. The allotments are located on both permanent and ephemeral rangelands.

3.7.8 Socioeconomics

3.7.8.1 Population, Housing, and Economic Characteristics

In Arizona, Apache, Navajo, Coconino, Yavapai, and Mohave Counties are all potentially affected by the Transwestern Project. These counties were profiled in Sections 3.1.8.1 and 3.6.2.8.1.

In New Mexico, Eddy, Lea, Lincoln, Torrance, Socorro, Valencia, Cibola, and McKinley Counties are all proposed to be the sites of some construction. These counties were profiled in Section 3.6.2.8.1.

In Texas, Ward county is traversed by the Transwestern Pipeline and therefore may be affected by its expansion. The county is predominantly rural with much of the employed labor forces (6,924 employed) involved in oil and gas development. The percent of employment in the county concentrated in oil and gas development is around 25 percent which is very high relative to other areas. The area is currently suffering the economic consequences of the depressed oil and gas development industry due to low oil and gas prices. As the price of oil has fallen the unemployment rolls have increased.

Population in the county was 13,976 in 1980 and grew to 16,000 by 1984. Housing units total 5,246 for the county and vacancy rates are 9.2 percent. There are temporary accommodations in the county; however, in the nearby cities of Pecos and Monahans, 511 and 180 hotel and motel rooms exist, respectively. The Odessa-Midland area is approximately 50 miles northeast of the nearest pipeline location and may provide some temporary accommodations for construction workers.

Per capita personal income in the county was $10,407 in 1983. This amount is higher than most counties and reflects the fact that there are very few residents of this county who are not part of the labor force. Most of the residents work on the oil and gas development or production projects and keep a family in their home state. Total personal income for the county was $164.9 million in 1983 of which $100.0 million was in wages and salaries.

3.7.8.2 Traffic

The proposed looping of the West Texas Lateral and mainline begins in Pyote, Texas, crosses New Mexico and Arizona, and terminates at the Needles Meter station on the east side of the Colorado River. Loop 1 of the West Texas Lateral is in Ward County, Texas, and Loop 2 is in Lea and Eddy Counties, New Mexico. There are nine loops on the Mainline; these are in Lincoln (A and B), Socorro (B), Torrance (B), Valencia (C and D), and McKinley (D and E) in New Mexico, and Apache (E), Navajo (F), Coconino (F and G), Yavapai (H),and Mohave (I) in Arizona. Table 3.7-9 presents crossing data for roadways. Most of these roadways are county and local roads.

3.7.8.3 Noise

Ambient noise levels for the Transwestern Expansion proposal were estimated using data presented in Section 3.1.8.3. The Transwestern proposal can be divided into two major sections: the West Texas Lateral and the Transwestern Mainline. The ambient noise levels were quantified and the relationships between population and sound levels suggested by the National Research Council [1977] have been presented in Table 3.1-17.

Table 3.7-9

TRANSPORTATION CORRIDOR CROSSINGS, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	U.S. Interstate	U.S. Federal	State	County & Local 1/	Railroads 2/
Loop 1	-	-	-	-	-
Loop 2	-	US 62/180	-	7	-
Loop A	-	-	-	12	-
Loop B	-	US 60	NM 14(3)	21	-
Loop C	-	-	-	-	-
Loop D	-	-	NM 547, 53/334,57	16	-
Loop E	-	-	AZ 63/ US 191	12	AT&SF
Loop F	-	-	AZ 87	39	-
Loop G	-	US 89,180	-	4	-
Loop H	I-40(3)	-	-	15	-
Loop I	-	-	-	40	-

1/ includes Navajo Nation and Forest Service numbered routes, and unimproved or gravel/graded roads

2/ AT&SF = Atchison and Topeka and Santa Fe Railroad

Numbers in parentheses indicate number of crossings

Existing sound levels may exceed the levels indicated in Table 3.1-17 for areas in close proximity to existing compressor stations. These levels may be more similar to the levels measured at the existing compressor station at Topock, Arizona as described in Section 3.1.8.3. ~~In these areas existing sound levels may be as high as 80 dBA.~~

Ambient noise levels for the Transwestern Mainline were also quantified using the methodology outlined in Section 3.1.8.3.

3.7.8.4 Recreational Resources

The eleven proposed loops on the West Texas Lateral and mainline pass through a variety of land jurisdictions, but few recreational resources are located within the mile-wide study corridor. The BLM lands in New Mexico offer a variety of recreational uses: hiking, rock hounding, wood gathering and hunting, and off-road vehicle use where permitted. Loop B passes within .5 mile of the northwestern boundary of Salinas National Monument at Gran Quivira in Torrance County. Although there is a small museum, exhibits, and a trail around the ruin, there are no camping or trailer facilities within the national monument itself.

In northern Arizona Loop G passes through Coconino and Kaibab National Forests in a designated utility corridor. No established campground facilities are within .5 mile of the route. Loop I extends between Kingman, Arizona, and the Colorado River. Near the west end of the loop Cimarron Lake is within .5 mile of the loop, and is privately owned and operated.

3.7.9 Land Ownership/Use

Transwestern's proposed West Texas Lateral and Mainline expansion project consists of 11 loops for a total of 356.2 miles in the states of Texas, New Mexico, and Arizona. It would traverse one county in Texas (Ward), eight in New Mexico (Lea, Eddy, Lincoln, Socorro, Torrance, Valencia, Cibola, and McKinley), and five in Arizona (Apache, Navajo, Coconino, Yavapai, and Mohave). Table 3.7-10 shows the approximate number of miles crossed in each county by loop segment and also shows the ownership status of the lands. The land ownership categories are private, BLM, FS, state, and Indian. The approximate locations of lands administered by each of these different entities are shown on the 1:250,000 scale maps in Volume IV. The land use for the expansion project is categorized as agriculture (irrigated and non-irrigated), rangeland/grazing, forest/timber, commercial/industrial, residential, and other. Land uses by county and loop segment are presented in Table 3.7-11 and the approximate locations of each are shown on the maps in the map volume. Table 3.7-12 summarizes the rules and regulations of the various administrative agencies.

Transwestern's West Texas Lateral Loop 1 (MP 0.0-4.1) is proposed to cross 4.1 miles in Ward County, Texas. Eighty-eight percent of this land is privately owned; 0.5 mile is controlled by the University of Texas (UT). This portion of Texas is used mainly for oil and gas production with the surface lands used for grazing. Ward County has no comprehensive plans or planning documents [Sitz, 1986].

Loop 2 (MP 77.5-88.0) of the West Texas Lateral is 10.5 miles long and passes through portions of Lea and Eddy Counties in New Mexico. Ninety percent of the land is controlled by the BLM and is predominantly leased for grazing and oil and gas production [Kelley, 1986]. The one mile of state land is also leased for grazing. In New Mexico, state lands are administered by the Commissioner of Public Lands.

Loop A (MP 29.0-55.0) is located totally in Lincoln County, New Mexico. The land ownership is split almost equally between private and BLM with a small portion controlled by the state. The private land has no identified land use regulations on a county level.

Loop B (MP 86.6-131.35) also begins in Lincoln County, passes through a small portion of Socorro County, into Torrance County and then reenters and ends in another portion of Socorro County, New Mexico. The majority of the land is privately owned, with one mile controlled by the BLM and about 16 miles of state owned property. Overall the land is used for livestock grazing, but it does cross approximately 4.5 miles of dryland agriculture which is usually planted in pinto beans. None of the land the pipeline crosses is considered by the Soil Conservation Service to be prime or important farm land. Approximately 0.4 mile is on private land within the Cibola National Forest boundary. The Forest Service has no control over this private land even though it falls within the designated boundary line [Salyer, 1986]. Loop B also passes within 0.5 mile of Salinas (Gran Quivira) National Monument. The loop will pass through approximately 10.6 miles of the White Sands Missile Range Reservation "Fix Area Range Extension" in Torrance County. Neither Socorro nor Torrance County has any identified land use plans relevant to the proposed pipeline [Cole and Quintana, 1986].

Loop C (MP 173.25-200.5) traverses Valencia and Cibola Counties; approximately 81 percent of this land is controlled by the ~~Laguna Indian Reservation~~ Pueblo of Laguna. Any land transaction would require the approval of the Pueblo of Laguna and the BIA. Valencia County has a draft comprehensive plan which has two policies regarding pipelines; one involves scenic impact and the other environmental impact. In Cibola County the pipeline only passes through Laguna lands.

Loop D (MP 224.0-271.25) traverses Cibola and McKinley Counties, New Mexico. The majority of the land is privately owned. The 2.6 miles of BLM land is leased for grazing except for Section 20

Table 3.7-10

LAND OWNERSHIP, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	County, State	Total	Private Miles	Private %	BLM Miles	BLM %	State Miles	State %	Indian Miles	Indian %	FS Miles	FS %
West Texas Lateral Loop 1	Ward, TX	4.1	3.6	(88)	-	-	0.5	(12)	-	-	-	-
Loop 2 1/	Eddy, NM	10.0	-	-	9.0	(90)	1.0	(10)	-	-	-	-
Loop 2 1/	Lea, NM	0.5	-	-	0.5	(100)	-	-	-	-	-	-
Subtotal		10.5	-	-	9.5	[90]	1.0	[10]	-	-	-	-
Loop A 1/	Lincoln, NM	26.0	11.4	(44)	13.7	(53)	0.9	(3)	-	-	-	-
Loop B 1/	Lincoln, NM	9.2	6.9	(75)	-	-	2.3	(25)	-	-	-	-
Loop B 1/	Socorro, NM	12.4	10.3	(83)	1.0	(8)	1.1	(9)	-	-	-	-
Loop B 1/	Torrance, NM	23.1	10.4	(45)	-	-	12.7	(55)	-	-	-	-
Subtotal		44.7	27.6	[62]	1.0	[2]	16.1	[36]	-	-	-	-
Loop C 1/	Valencia, NM	14.0	4.4	(31)	-	-	0.8	(6)	8.8	(63)	-	-
Loop C 1/	Cibola, NM	13.2	-	-	-	-	-	-	13.2	(100)	-	-
Subtotal		27.2	4.4	[16]	-	-	0.8	[3]	22.0	[81]	-	-
Loop D 1/	Cibola, NM	18.0	15.6	(87)	1.0	(6)	1.4	(8)	-	-	-	-
Loop D 1/	McKinley, NM	29.3	16.1	(55)	1.6	(5)	4.2	(14)	7.4	(25)	-	-
Subtotal		47.3	31.7	[67]	2.6	[5]	5.6	[12]	7.4	[16]	-	-
Loop E 1/,2/	McKinley, NM	7.5	3.6	(48)	-	-	-	-	3.9	(52)	-	-
Loop E 2/	Apache, AZ	30.0	-	-	-	-	-	-	30.0	(100)	-	-
Subtotal		37.5	3.6	[10]	-	-	-	-	33.9	[90]	-	-
Loop F 1/	Navajo, AZ	34.9	5.3	(15)	-	-	-	-	29.6	(85)	-	-
Loop F 1/	Coconino, AZ	6.5	1.0	(15)	-	-	-	-	5.5	(85)	-	-
Subtotal		41.4	6.3	[15]	-	-	-	-	35.1	[85]	-	-
Loop G 2/	Coconino, AZ	36.5	5.2	(14)	-	-	-	-	-	-	31.3	(86)
Loop H 1/,2/	Yavapai, AZ	38.6	20.6	(54)	-	-	18.0	(46)	-	-	-	-
Loop H 1/	Mohave, AZ	11.0	8.4	(76)	-	-	2.6	(24)	-	-	-	-
Subtotal		49.6	29.0	[59]	-	-	20.6	[41]	-	-	-	-
Loop I 1/	Mohave, AZ	31.5	14.5	(46)	14.4	(46)	1.3	(4)	1.3	(4)	-	-
Total		356.3	137.3	[39]	41.2	[12]	46.8	[13]	99.7	[28]	31.3	[9]

1/ BLM 1:100,000 Surface Management Status Maps 2/ BLM 1:500,000 Land Status Maps

( ) Percentages within county; [ ] Total percentages within loop or line; BLM = Bureau of Land Management; FS = Forest Service

Table 3.7-11

LAND USE, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	County, State	Total Miles Traversed	Grazing/ Rangeland Miles	%	Timber/ Forestland Miles	%	Residential Miles	%	Other Miles	%
West Texas Lateral										
Loop 1	Ward, TX	4.1	4.1	(100)	-	-	-	-	-	-
Loop 2	Eddy and Lea, NM	10.5	10.5	(100)	-	-	-	-	-	-
Mainline										
Loop A	Lincoln, NM	26.0	26.0	(100)	-	-	-	-	-	-
Loop B	Lincoln, Socorro, and Torrance, NM	44.7	44.7	(100)	-	-	-	-	-	-
Loop C	Valencia and Cibola, NM	27.2	27.2	(100)	-	-	-	-	-	-
Loop D	Cibola and McKinley, NM	47.3	47.3	(100)	-	-	-	-	-	-
Loop E	McKinley, NM Apache, AZ	37.5	37.5	(100)	-	-	-	-	-	-
Loop F	Navajo and Coconino, AZ	41.4	41.4	(100)	-	-	-	-	-	-
Loop G	Coconino, AZ	36.5	5.2	(14)	31.3	(86)	-	-	-	-
Loop H	Yavapai Mojave, AZ	49.6	49.6	(100)	-	-	-	-	-	-
Loop I	Mohave, AZ	31.5	17.5	(56)	-	-	9.6	(30)	4.4 [1]	(14)
TOTAL		356.3	311.0	(87)	31.3	(9)	9.6	(3)	4.4	(1)

---

[1] Wildlife habitat

Table 3.7-12

FEDERAL, STATE AND COUNTY LAND USE REGULATIONS AND POLICIES, TRANSWESTERN EXPANSION PROPOSAL

Administrative Agency	Document	Policies/Requirements
FEDERAL		
Department of Interior		
Bureau of Land Management		proposed pipelines should locate within existing utility corridors or windows/special use permit
Phoenix District	Resource Management Plan	within an existing utility corridor
Roswell District	Resource Management Plan	no designated utility corridors
Socorro District	Resource Management Plan	there are existing corridors in the plan but this would not prevent the expansion project
Albuquerque District	Resource Management Plan	within an existing utility corridor
Department of Defense		
White Sands Missile Range		consultation with White Sands' officials
Department of Agriculture		
National Forest Service		proposed pipelines should locate within existing utility or windows/special use permit
Cibola Forest	Final Environmental Impact Statement	pipeline is within boundaries but on private land the forest service has no policies or regulations on private land
Coconino Forest	Draft Environmental Impact Statement	within existing utility corridor
Kaibab Forest	Draft Environmental Impact Statement	within existing utility corridor
Navajo Nation		consultation with tribal officials
Pueblo of Laguna		consultation with tribal officials
Fort Mojave Indian Reservation		consultation with tribal officials

Table 3.7-12 (continued)

FEDERAL, STATE AND COUNTY LAND USE REGULATIONS AND POLICIES, TRANSWESTERN EXPANSION PROPOSAL

Administrative Agency	Document	Policies/Requirements
STATE		
University of Texas System	The University of Texas System Rate and Damage Schedule, 1986	apply for easement and notify grazing leasee
New Mexico State Lands Commission	Rules and Regulations Concerning the Sale, Lease, and Other Dispositions of State Trust Land, 1984	apply for a grant to construct
Secretary of State, Arizona	Official Compilation of Administrative Rules and Regulations, 1977	apply for right-of-way and consent from leasee
COUNTY		
Lincoln, New Mexico	Lincoln, NM; A Plan for Preservation and Growth, 1974	
	Lincoln Historic Preservation Ordinance, 1984	
	Ruidoso-Lincoln County Zoning	no reference to pipeline regulations
	Authority Meeting; April, 1986	consultation with county manager and commission
Valencia, New Mexico	Valencia County Draft Comprehensive Plan; March, 1986	
Apache, Arizona	Apache County Comprehensive Plan	proposed route not in plan's jurisdiction
Coconino, Arizona	Coconino County General Plan 1990, 1976 Bellemont Area Plan	no reference to pipeline regulations
Mohave, Arizona	Mohave Valley South, 1980	no reference to pipeline regulations

of Range 9W Township 11N which is leased for a sand and gravel operation. Approximately 3.2 miles of the Navajo Nation land traversed are Individual Indian Allotments. These lands are administered by the Bureau of Indian Affairs (BIA); "as part of a trust responsibility, the BIA must act on the behalf of the Indian Allottees [Deschine, 1986]. The remaining 4.2 miles are lands purchased by the United States Indian Service; "these lands were placed in Trust for the Navajo Indian Tribe" [Deschine, 1986] and are administered by the Navajo Nation. There are three houses within 100 feet of the proposed pipeline at MP 225.8. Cibola and McKinley Counties have no identified land use plans [Quintana, 1986].

Loop E (MP 303.25-340.75) is located in both New Mexico and Arizona (McKinley and Navajo Counties). Ninety percent of the land is Navajo Tribal land or allotted lands. All the Navajo land in McKinley County consists of Individual Allotment lands. The majority of the land is used for grazing. The 3.6 miles of private land are not controlled by the Navajo Nation. Of the Indian land, 11.5 miles are in the Navajo Nation Forest. This land is used for commercial timbering and grazing in conjunction with Navajo Forest Products Industries. One house and one hogan are within 100 feet of the proposed pipeline at MP 305.4.

Loop F (MP 375.25-416.75) traverses Navajo and Coconino Counties in Arizona. The largest portion of this land is controlled by the Navajo Nation; the land use is livestock grazing except around the small community of Dilkon. The land use there is residential/commercial with some grazing. There are no homes within 100 feet of the proposed loop.

Loop G (MP 449.9-485.5) in Coconino County passes through about 25.7 miles of Coconino National Forest and 5.5 miles of Kaibab National Forest. The proposed expansion is within existing utility corridors in both forests. The pipeline is proposed to pass along the northern edge of three sections of the Fort Valley Experimental Forest within the Coconino National Forest. The proposed pipeline also passes within 1/4 mile of the Kachina Peaks Wilderness. It crosses Forest Road 146 which parallels the waterline for the City of Flagstaff. Three private inholdings within National Forest boundaries could be impacted, but Coconino County has no plans for these areas [McGregor, 1986]. These include Black Bill Park and Fort Valley in Coconino National Forest and Sherwood Forest Park, Mountainview Acres and Forest Ranches in Kaibab National Forest. These areas are subdivided and the land use is rural residential. There are eight houses within 100 feet of the pipeline between MP 481.5 and 482.5.

Loop H (MP 526.75-576.25) crosses Yavapai and Mohave Counties in Arizona. The land ownership is almost equally divided between state and private. The land use is primarily rangeland, with one mile of cultivation (MP 570 to 571). Neither county has plans or regulations that would affect the implementation of the project [Inman, 1986; Mohave County, 1980].

Loop I (MP 613.0-644.5) in Mohave County, Arizona, crosses equal amounts of private and BLM lands with a little more than a mile each of state land and Fort Mojave Indian Reservation (FMIR) land. The BLM lands are primarily leased for grazing with three miles designated wildlife habitat with no grazing. The loop skirts the edges of two wilderness study areas. The FMIR land is being considered for development in 1989-1991, but is currently undeveloped [Garcia, 1986]. The private land is primarily rural residential, but there is some mining activity around MP 630.

3.7.10 Cultural Resources

3.7.10.1 Archaeology

A total of ~~389~~ 380 cultural resource sites have been documented for all of the Transwestern Expansion Proposal loops. ~~None are~~ One is listed on the National Register and none have been declared eligible for register status. ~~Ten~~ Seven sites have been determined ineligible.

The cultural resources located within the mile-wide corridors for the various loops are presented in Tables 3.7-13 and 3.7-14 which summarize numbers of sites, their National Register status and data on site types. The data in these tables reflect the information available as of April 1986. In most instances, only small portions of the pipeline corridors have been the subject of ground surveys performed to federal standards and as such there are large gaps in the data. The fact that some pipeline segments contain few sites frequently reflects the general lack of research in the area. Prior to actual pipeline construction, it will be necessary to conduct intensive on-the-ground surveys to ascertain the full extent of cultural resources present in the actual construction corridors. Please note that the tables in this section summarize the known cultural resources within the mile-wide corridors. The actual discussion of those sites within the proposed project construction ROWs will be presented in the impact section.

The tables summarizing and interpreting the cultural resources for the Transwestern Expansion Proposal are based on the data presented in some detail in the Cultural Resources Technical Report [de Barros, 1986]. Details of past survey coverage and an overview of the prehistory, history and ethnohistory of the project area are also contained in the technical report.

Table 3.7-13

KNOWN CULTURAL RESOURCE SITES, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Loop and State	Sites and National Register Status 1/			
	Listed on NRHP	Determined Eligible/ Nominated	Determined Ineligible	Undetermined
TEXAS				
Loop 1	-	-	-	-
NEW MEXICO				
Loop 2	-	-	-	5
Loop A	-	-	-	-
Loop B	1	-	-	13
Loop C	-	-	1	20
Loop D	-	-	5	110
NEW MEXICO/ ARIZONA				
Loop E 2/	-	-	-	19
ARIZONA				
Loop F	-	-	1	68
Loop G	-	-	-	124
Loop H	-	-	-	8
Loop I	-	-	-	5
Total Sites	1	-	7	372

1/ National Register status here refers only to the result of official determinations. Many other sites may meet the eligibility criteria but have not been formally evaluated. In addition, three historic sites on Loop I are listed in the Arizona SHPO files.

2/ Five sites in Arizona which have names, but no map location or site descriptive data, are not included here.

Table 3.7-14

KNOWN CULTURAL RESOURCE TYPES, TRANSWESTERN EXPANSION PROPOSAL

	Pipeline Loops								
Type	2	B	C	D	E	F	G	H	I
Habitation									
Roomblock	-	1	1	32	-	-	12	-	-
Pithouse	-	1	1	6	-	-	23	-	-
Village	-	-	-	-	-	-	1	-	-
Cliff Dwelling	-	-	-	1	-	-	-	-	-
Scatters									
Lithic	1	-	2	1	-	3	10	2	(1)
Ceramic	-	-	2(3)	14	1(4)	3	9	-	1
Groundstone	-	-	-	2	-	-	-	-	-
Lithic+Ceramic	-	1(3)	4(7)	8	(1)	18	9	1(4)	-
Lithic+Groundstone	1	-	1	1	-	-	-	-	-
Lithic+Ceramic+ groundstone	2	-	-	3	-	-	-	-	-
Lithic+Ceramic+Bone	-	-	-	2	-	-	-	-	-
Features									
Other Combinations	-	-	1	1	-	-	-	-	-
Structures	-	5	4	9	-	23	28	3	-
Structures?	-	-	-	-	-	14	6	-	-
Foundation	-	2	-	(1)	-	-	-	-	-
Fieldhouse	-	-	-	-	-	-	12	-	-
Bedrock Mortar(s)	(1)	-	-	-	-	-	-	-	(1)
Mound	-	-	-	4	-	-	-	-	-
Midden	-	-	-	(1)	-	-	-	-	-
Kiva	-	-	-	(4)	-	-	-	-	-
Roasting Pit	-	-	-	1	-	-	-	-	-
Hearth(s)	1	1	2	8	-	-	1	-	-
Rock Alignment	-	-	1	2(1)	(1)	-	-	-	-
Rockshelter	-	-	-	2	-	-	4	1	1
Check Dam	-	-	-	-	-	-	1(2)	-	-
Quarry	-	-	-	-	-	6	-	-	-
Burial	-	-	(1)	1	-	-	-	-	-
Trail	-	-	-	-	-	1	-	-	-
Rock Art	-	2	-	-	-	-	-	-	-
Rock Ring	-	-	-	-	-	-	-	1	-
Rock Pile	-	-	-	-	-	-	1	-	-
Hunting Blind	-	-	-	-	-	-	1	-	-
Shrine	-	(1)	(1)[1]	-	-	-	-	-	-
Depression	-	-	-	(2)	-	-	-	-	-
Bin(s)	-	(1)	-	(2)	-	-	1	-	-
Other	-	-	2	-	-	-	-	-	-

Table 3.7-14 (continued)

KNOWN CULTURAL RESOURCE TYPES,
TRANSWESTERN EXPANSION PROPOSAL

Type	Pipeline Loops								
	2	B	C	D	E	F	G	H	I
Historic Features									
Historic Trash	-	(1)	-	2(5)	(2)	-	1	-	-
Historic Dump	-	-	-	-	-	1	-	-	-
Historic Structure	-	-	-	-	-	-	1	-	-
Ghost Town	-	-	-	-	-	-	-	-	1
Shelter/Ramada	-	-	-	-	(1)	-	-	-	-
Corral/Pen	-	-	-	1(3)	4(4)	-	-	-	-
Hogan	-	-	-	14	12	-	-	-	-
Sweatlodge	-	-	-	(2)	1	-	-	-	-
Road/Trail	-	-	-	-	-	-	-	-	2
Monument	-	1	-	-	-	-	-	-	-
Other	-	-	-	(1)	-	-	1	-	-
Unknown	-	-	-	-	1	-	2	-	-
Total Sites	5	14	21	115	19	69	124	8	5

1/ This shrine represents a contemporary shrine on the Laguna Indian Reservation.

Figures in parentheses refer to additional instances occurring at sites already counted once in the table. Loop 1 and Loop A have no sites.

Summary. Of the 356.4 miles of proposed expansion loops, 23.75 miles (6.7 percent) of construction ROW have been previously surveyed. Another 1.2 miles of survey were conducted directly adjacent to (perhaps partially covering) the ROW. A total of 380 prehistoric and historic sites have been documented for the proposed expansion loops. Among these, the Gran Quivira National Monument is listed on the National Register. None of the other sites are listed on, or have been determined to be eligible for, the National Register. Seven sites have been officially determined ineligible.

There are ~~four~~ five high sensitivity pipeline segments along these loops.

Note: Parts of the analysis corridors for Loops C, D, F, and J were surveyed by Wendorf et al. [1956], but this survey was not done to BLM standards, as defined in Section 3.6.1.10.1.

3.7.10.2 American Indian Concerns

In order to document such concerns, a letter explaining the proposed expansion project was sent with appropriate route maps to appropriate Indian groups and individuals. As discussed in Section 3.1.10.2, this letter asked specific questions regarding American Indian heritage values.

Because several of the proposed expansion loops (Loops D, E and F) traverse important sections of the Navajo Indian Reservation in Arizona and New Mexico, the Navajo Tribe was contacted directly by an ethnographer who has long worked with them. He conducted interviews with numerous tribal officials at both the tribal and chapter levels. A list of those contacted is presented in the Cultural Resources Technical Report.

The Navajo are very concerned about archaeological sites and their contents, sacred sites of all kinds, burial sites, and sacred traditional plants and animals. They also have well developed written policies regarding their preservation. (See Section 4 on mitigation measures; copies of these policies have been included in the Cultural Resources Technical Report). Some Navajo tribal and chapter representatives also expressed concern about impacts to livestock and wish to be informed about fencing and livestock control during the construction period.

The Pueblo of Laguna (New Mexico) was also contacted directly by an ethnographer because Loop C passes through a large portion of their pueblo lands. They requested and received more precise routing information on Loop C. Initially there was concern for a contemporary shrine which was thought to lie within the mile-wide analysis corridor. Subsequent clarification by telephone, however, revealed that the shrine was located at least a mile outside the corridor.

Since Loop I traverses about 1.5 miles of the eastern portion of the Fort Mojave Indian Reservation in Arizona, the Tribal Council in Needles was contacted and a personal presentation of the project was made. This was followed up by interviews of certain council members.

In addition to information obtained during the council meeting in Needles, the Fort Mojave tribe responded in writing to requests for information. They have recently adopted a new resolution which seeks to protect traditional use areas inside and outside reservation boundaries. (See Section 3.1.10.2 for details regarding the general concerns of the Fort Mojave Tribe). In the case of the proposed Transwestern Expansion, they are particularly concerned about the potential disturbance of burial areas situated on the eastern side of the Colorado River. In general, they do not wish to see pipeline laid within reservation boundaries or within traditional use areas west and east of the Colorado River.

The Pueblo of Acoma (New Mexico) also requested and received more precise routing information on Loop D which passes close to their lands (Horace Mesa). Acoma lands are not located within the mile-wide analysis corridor.

The Pueblo of Zuni (~~Arizona~~ New Mexico) did not express any site-specific concerns, but did emphasize their concern regarding any human burials which may be encountered along the route.

The proposed expansion loops do not cross the Pueblo of Isleta (New Mexico), but the Isleta expressed a general concern about ancestral (archaeological) sites, burials, sacred sites and traditional plant and animal species.

Finally, the Hopi Indian Tribe of Arizona is concerned about the possibility that blasting during the construction of the eastern portion of Loop F may scare away golden eagles from their sacred nesting places east and northeast of Dilkon.

3.7.11 Paleontological Resources

Paleontologic resources for the Transwestern Expansion Proposal have been divided into looped segments. Table 3.7-15 lists the formations for the this proposal. A more detailed discussion of all of the paleontologic resources has been provided in the Paleontologic Resource Assessment Technical Report [Morales, et al. 1987].

3.7.12 Visual Resources

The scenic environment of the study area is generally characteristic of the lower and upper Sonoran Desert in Texas, northwestern New Mexico, and north-central Arizona. The landforms consist of desert valleys, hills, steep mountains and high plains. The vegetation is sparse.

The color of the lower and upper Sonoran mountain and desert landscape ranges from dark grays, reds, and browns to light tans, and light and dark green. Textures are medium to coarse for the mountain/hill areas, smooth to fine for the plains and wash areas.

Man-made features become more dominant in urbanized areas and centers such as Flagstaff and Albuquerque. There are no known architectural structures of scenic significance.

The BLM and the FS have categorized the scenic resources within the study area. The predominant visual resource management classes in the study area are identified by line and milepost segment.

Refer to Section 3.1.12 for methodology.

Table 3.7-15

PALEONTOLOGICAL FORMATIONS, TRANSWESTERN EXPANSION PROPOSAL

Age	Formation	Potential 1/ Vertebrate/ Invertebrate	Sensitivity
LOOP 1			
Quaternary	Quaternary dunes	H/L	Yes
LOOP 2			
Quaternary	Quaternary dunes	H/L	Yes
Quaternary	Quaternary eolian	L/L	No
Middle-Late Triassic	Santa Rosa Formation	H/H	Yes
Quaternary	Quaternary alluvium	L/L	No
LOOP A			
Permian	San Andres Formation	L/H	No
LOOP B			
Permian	San Andres Formation	L/H	No
Quaternary	Quaternary eolian	L/L	No
Lower Permian	Yeso Formation	L/H	No
Tertiary	Tertiary igneous intrusives	L/H	No
Permian	Abo Formation	H/H	Yes
Lower Permian	Bursum Formation	L/H	No
LOOP C			
Quaternary	Quaternary alluvium	L/L	No
Miocene-Pleistocene	Santa Fe Group	H/L	Yes
Middle Jurassic	Todilto Formation	H/H	Yes
Upper Jurassic	Morrison Formation	H/L	Yes
Quaternary	Quaternary pediment gravels	L/L	No
Quaternary	Quaternary sands	H/L	Yes
Permian	San Andres Formation	L/H	No
Quaternary	Quaternary basalts	L/L	No
Middle Jurassic	Entrada Sandstone	L/L	No
Jurassic	Bluff Sandstone	L/L	No
Quaternary	Quaternary diabase dike	L/L	No
LOOP D			
Quaternary	Quaternary alluvium	L/L	No
Late Triassic	Chinle Formation	H/H	Yes
Upper Cretaceous	Dakota Sandstone	L/H	No
Upper Jurassic	Morrison Formation	H/L	Yes
Middle Jurassic	Todilto Formation	H/H	Yes
Quaternary	Quaternary colluvium	L/L	No
Quaternary	Quaternary basalts	L/L	No

Table 3.7-15 (continued)

PALEONTOLOGICAL FORMATIONS,
TRANSWESTERN EXPANSION PROPOSAL

Age	Formation	Potential [1/] Vertebrate/ Invertebrate	Sensitivity
LOOP E			
Quaternary	Quaternary alluvium	L/L	No
Upper Cretaceous	Mesa Verde Group	H/H	Yes
Upper Cretaceous	Crevasse Canyon Formation	L/H	No
Upper Cretaceous	Gallup Sandstone	L/H	No
Upper Cretaceous	Mancos Shale	L/H	No
Upper Jurassic	Morrison Formation	H/L	Yes
Late Triassic	Chinle Formation	H/H	Yes
Lower Permian	de Chelly Sandstone	M/L	No
Uppermost Miocene	Bidahochi Formation	H/L	Yes
Lower Middle Triassic	Meonkopi Formation	M/L	No
LOOP F			
Uppermost Miocene	Bidahochi Formation	H/L	Yes
Quaternary	Quaternary alluvium	M/L	No
Upper Triāssic	Wingate Formation; Lukachukai Member	M/L	No
Upper Triassic	Wingate Formation; Rock Point Member	M/M	No
Late Triassic	Chinle Formation	H/H	Yes
LOOP G			
Quaternary	Quaternary basalt	L/L	No
LOOP H			
Quaternary	Quaternary basalts	L/L	No
Quaternary	Quaternary alluvium	M/L	No
Quaternary-Tertiary	Quaternary-Tertiary sediments	L/L	No
Devonian-Mississipian	Redwal Limestone and Martin Formation	M/H	No
Tertiary	Tertiary basalts	L/L	No
Tertiary	Nonmarine sediments	L/L	No
Precambrian	Precambrian granite	L/L	No
LOOP I			
Quaternary-Tertiary	Quaternary-Tertiary	L/L	No
Tertiary	Tertiary volcanics	L/L	No

[1/] L = low M = moderate H = high

Loop G

MP 449.0-476.1, VRM/VQO: FS Class M, PR, R, P
Description: Coconino National Forest. The landform consists of gently sloping desert transition to higher elevation slopes at the base of the San Francisco Peaks. The vegetation consists of chaparral, desert grassland, mountain grassland, pine and juniper forests. Modifications include an existing Transwestern pipeline, transmission lines, Highways 89 and 180, and Forest Service access roads.

MP 476.1-486.5, VRM/VQO: FS Class PR, M
Description: Kaibab National Forest. The landform consists of higher elevation plateau on Sitgreaves Mountain. The vegetation consists of chaparral, desert grassland, mountain grassland, pine and pinyon-juniper forests, and juniper forests. Modifications include existing Transwestern pipeline, the town of Parks, Highway 40, interspersed ranches, jeep trails, mines, transmission lines, and access roads.

Loop I

MP 613.0-636.0, VRM/VQO: BLM Class II, III
Description: The landform consists of wide desert valley adjacent to lower desert foothills. The vegetation consists of creosote bush scrub. Modifications include an existing Transwestern pipeline, Interstate 40, mining operations, transmission lines, and access roads.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Chapter 4 presents a discussion of the environmental consequences that would result from implementing the Mojave and El Dorado proposals and the El Paso, Northwest, and Transwestern Expansion Proposals and their respective alternatives. In keeping with NEPA and CEQA guidelines, this chapter focuses on the impacts that are considered significant. The general approach followed throughout this chapter is to briefly discuss the range of impacts that would occur and then provide a detailed discussion of those impacts that are considered significant.

Following the discussion of impacts, Chapter 4 provides planned mitigation measures put forth by the applicant. These mitigation measures are evaluated and determinations on significance have been revised. If the significance rating has not been reduced to acceptable levels, a second set of mitigation measures, if appropriate, was developed by the EIS study team. The impacts were then reassessed and determinations on unavoidable adverse impacts were made.

4.2 MOJAVE PIPELINE PROPOSAL

4.2.1 Air Quality

4.2.1.1 Project Emissions

4.2.1.1.1 Installation/Construction Emissions and Impacts

The installation/construction phase of the proposed project includes installation of the pipeline and construction of meter and compressor stations. Emissions associated with these activities would include fugitive dust and construction equipment exhaust emissions. Exhaust emissions would include carbon monoxide (CO), sulfur oxides (SO_2), nitrogen oxides (NO_x), hydrocarbons (HC), total suspended particulates (TSP), and fine pollutants based on the applicant's projected equipment usage. Emission factors for construction equipment and off-road trucks were obtained from the EPA publication AP-42 [EPA, 1985] and from the California Air Resources Board [CARB, 1986]. Emissions from construction activities would be confined to the daily working hours for the duration of the construction phase. A ten-hour work day was assumed in this analysis.

Total estimated construction emissions for each portion of the construction activity occurring within California are presented in Table 4.2-1. Specific assumptions regarding usage, engine sizes and emission factors used in this analysis are included in the Air Quality/Meteorology Technical Report. Only emissions occurring within California are reported for reasons discussed below.

Table 4.2-1

TOTAL ESTIMATED CONSTRUCTION EMISSIONS WITHIN CALIFORNIA, [1]
MOJAVE PIPELINE PROPOSAL

	Total Project Emissions (tons)					
	THC	NO_x	SO_2	CO	TSP	PM10
Pipeline	51.71	273.00	25.33	148.19	767.46	497.88
Meter Station	0.06	0.30	0.03	1.03	0.64	0.42

---

[1] TSP and PM10 fugitive dust emissions include a 50 percent reduction due to watering.

As stated in Section 3.1, pollution emissions that occur during construction are generally exempt for PSD review because the PSD requirements specifically exempt temporary increases of SO_2 and TSP emissions.

None of the states have construction-related emission standards. New Source Review (NSR) regulations of California Air Resources Board (CARB) and the respective Air Pollution Control Districts (APCD) of Kern and San Bernardino counties do not address whether or not emissions from construction activities are regulated. Presently, construction activities are not regulated by the two local APCDs. As such, there are no emission impact standards with which the emissions from these construction activities can be compared to determine whether a regulation violation will occur. Nevertheless, CARB notes that although an air quality permit may not be required, county land use permits require analysis of a project's air quality impacts under CEQA and air quality modeling is often used. Because CARB seeks this type of modeling, this has been done for the State of California only. The other states do not require modeling for construction and therefore modeling was not done. The predictions, for comparison purposes, are measured against the National Primary Ambient Air Quality Standards (NAAQS).

This results in a predicament. While the model shows ambient standards could be exceeded immediately adjacent to the ROW during adverse meteorological conditions, construction emissions are not regulated. The application of mitigation is thus not enforceable under current regulatory authority. This leads the preparers to seek assistance from interested parties and agencies responsible for regulating air quality impacts to address the issues raised above.

The short-term ISC modeling results for pipeline construction within California are presented in Table 4.2-2 and 4.2-3 along

Table 4.2-2

AIR QUALITY CONSTRUCTION IMPACTS THROUGH S.E. DESERT AIR BASIN, CALIFORNIA, MOJAVE PIPELINE PROPOSAL
(all values are in ug/m3)

Pollutant	Avg. Time	California Standard	State and Federal Standards		Project Impacts		
			Primary	Secondary	Project Increment	Background	Total
Carbon Monoxide (CO)	1-hr	23,000	40,000	40,000	961	12,000	12,961
	8-hr	10,000	10,000	10,000	625	4,000	4,625
Nitrogen Dioxide (NO_2)	1-hr	470	--	--	404	376	780
Sulfur Dioxide (SO_2)	1-hr	655	--	--	152	393	545
	3-hr	--	--	1,300	110	175	285
	24-hr	131	365	--	39	110	149
Total Suspended Particulates (TSP)	24-hr	--	260	150	746	144	890
Fine Suspended Particulated (PM-10)	24-hr	50	--	--	485	79	564

Background values were taken from:

CO - Barstow (CA)
NO_2 - Barstow (CA)
SO_2 - Riveria (AZ)
TSP - Barstow (CA)
PM/10 - 55% of TSP
1-hr SO_2 - Bakersfield (CA)

Table 4.2-3

CONSTRUCTION OF MOJAVE PIPELINE THROUGH KERN COUNTY, CALIFORNIA
(all values are in ug/m3)

			State and Federal Standards		Project Impacts		
Pollutant	Avg. Time	California Standard	Primary	Secondary	Project Increment	Background	Total
Carbon Monoxide (CO)	1-hr	23,000	40,000	40,000	961	16,000	16,961
	8-hr	0,000	10,000	10,000	625	13,000	13,625
Nitrogen Dioxide (NO_2)	1-hr	470	--	--	422	376	798
Sulfur Dioxide (SO_2)	1-hr	655	--	--	152	393	545
	3-hr	--	--	1,300	110	175	285
	24-hr	131	365	--	39	110	149
Total Suspended Particulates (TSP)	24-hr	--	260	150	746	328	1074
Fine Suspended Particulated (PM-10)	24-hr	50	--	--	485	180	665

Background values were taken from:
CO - Bakersfield (CA)
NO_2 - Barstow (CA)
SO_2 - Riveria (AZ)
TSP - Bakersfield (CA)
PM10 - 55% of TSP
1-hr SO_2 - Bakersfield (CA)

with local background concentrations and applicable state and federal standards.

The results indicate that pipeline construction would exacerbate the existing 8-hour CO standard exceedance in Kern County. The project contribution would be fairly small in comparison to the existing background. The California 1-hour NO_2 and the 24-hour SO_2 standard of 131 ug/m^3 would be exceeded in both Kern County and in the Southeast Desert Air Basin. The federal primary standard (260 ug/m^3) and secondary standard (150 ug/m^3) for 24-hour TSP would also be exceeded in both areas. The California standard of 50 ug/m^3 for 24-hour PM10 (which already is exceeded by high background values) would also be exceeded.

4.2.1.1.2 Operational Phase Emissions and Impacts

Operational phase emissions would occur due to natural gas combustion at the 22,500 hp MJ-1 compressor station. Six 3,750 hp reciprocating natural gas-fired compressor engines would be installed. Only five of the six compressors would operate at one time; the sixth compressor would be used as a spare. The five operating compressors would operate at an average capacity of 81 percent, while the maximum design day rating would be about 85 percent. Additional combustion emissions would result from occasional testing of an emergency generator.

NO_x, HC and CO emission estimates were based on AP-42 [EPA, 1985] emission factors. SO_2 and particulate emissions would be negligible. Fugitive hydrocarbon emissions from valves, flanges, etc. during the operational phase would also be negligible. Whatever small emissions do occur would be primarily photochemically nonreactive. Additional information concerning production phase emissions can be found in the Air Quality/Meteorology Technical Report.

Assumptions and hourly/annual emission associated with the proposed Topock Compressor Station are presented in Table 4.2-4A. Short- and long-term impacts from operations at the MJ-1 Compressor Station are presented in Table 4.2-4B.

Table 4.2-4A

WORST-HOUR AND ANNUAL AIR QUALITY EMISSION ESTIMATES,
MJ-1 COMPRESSOR STATION, ARIZONA

	Total Project Emissions (tons)					
	THC	NO_x	SO_2	CO	TSP	PM10
Worst-Hour (lb/hr)	157.89	390.66	0.07	50.46	0.00	0.00
Annual (tons/yr)	645.34	1596.72	0.27	206.24	0.00	0.00

Table 4.2-4B

WORST-HOUR AND ANNUAL OPERATIONS AT MJ-1 COMPRESSOR STATION, ARIZONA
(all values are in ug/m3)

Pollutant	Avg. Time	State and Federal Standards		Project Impacts		
		Primary	Secondary	Project Increment	Background	Total
Carbon Monoxide (CO)	1-hr	40,000	40,000	79	19,000	19,079
	8-hr	10,000	10,000	55	8,000	8,055
Sulfur Dioxide (SO_2)	3-hr	--	1,300	0	147	147
	24-hr	365	--	0	42	42
Total Suspended Particulates (TSP)	24-hr (Geo. Mean)	260	150	0	215	215
Nitrogen Dioxide (NO2)		100	100	59	31	90
Sulfur Dioxide (SO2)		80	--	0	27	27
Total Suspended Particulates (TSP)		75	60	0	93	93

Background values were taken from:
CO - Flagstaff (AZ)
NO2 - Bullhead City (AZ)
SO2 - Bullhead City (AZ)
TSP - Bullhead City (AZ)

Violations would only occur where background concentrations already exceed the standards. The short term SO_2 and TSP emissions and impacts for the compressor station would be zero; therefore, there would be no PSD incremental impacts.

4.2.2 Geology

4.2.2.1 Significance Criteria

The discussion of geological impacts includes geologic hazards and potential impacts of the project on the geologic environment.

The potential geologic hazards identified for the Mojave Proposal, which includes the Mojave Transfer Line, the Mojave Mainline, and the Kern Lateral, are summarized in Table 4.2-5. Geologic hazards and impacts are considered significant: 1) whenever there is a reasonable potential for rupture of the pipeline or damage to related facilities and where these hazards could present a significant threat to the public safety, and 2) where construction activities or the siting of facilities would worsen existing unfavorable geologic conditions, or preclude development of important mineral resources. Significance criteria are discussed below.

Geologic Hazards

o Earthquake-induced strong vibratory ground motion capable of damaging the pipeline directly. Generally, only very strong near-field ground motion could affect the buried pipeline itself. Ancillary facilities such as compressor stations and stream-spanning or bridging structures could be significantly damaged by ground motion from earthquakes originating at up to intermediate distances, depending on the design parameters and foundation conditions. The effects of low-amplitude, long-period ground motion from distant earthquakes would not be significant.

o Surface fault rupture leading to damage or failure of the pipeline. Significance criteria are based on the level of probability indicated by historical activity and paleoseismologic evidence that fault movement leading to damage or failure of the pipeline could occur at fault crossings.

o Secondary seismic effects, especially earthquake-induced ground failure, including liquefaction of water-saturated granular alluvial or lacustrine soils. Significance is based on the potential for ground failure resulting in damage to or failure of the pipeline or any critical ancillary facility. The liquefaction potential of otherwise susceptible deposits is very low where groundwater depth exceeds approximately 50 feet.

Table 4.2-5

SIGNIFICANT GEOLOGICAL HAZARDS, MOJAVE PIPELINE PROPOSAL

Mile-post	Location	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence	Flash Flooding
	Transfer Line					
1-16.5	Mojave Valley	-	-	-	-	X
	Mainline					
1	Colorado River floodplain near Topock, AZ	X	-	-	-	-
1-230	Mojave Desert	-	-	-	-	X
98	Ludlow fault, southeast of Ludlow	-	X	-	-	-
120	Pisgah fault, west of Hector	-	X	-	-	-
142	Calico fault, northeast of Yermo	-	X	-	-	-
147	Mojave River alluvium	X	-	-	-	X
152	Harper fault, north of Barstow	-	X	-	-	-
159	Unnamed fault near Barstow	-	X	-	-	-
165	Lockhart fault, southeast of Lockhart	-	X	-	-	-
180	South Lockhart fault, east of Kramer Junction	-	X	-	-	-
234	Garlock fault, west of Mojave	-	X	X	-	-

Table 4.2-5 (continued)

SIGNIFICANT GEOLOGICAL HAZARDS, MOJAVE PIPELINE PROPOSAL

Mile-post	Location	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence	Flash Flooding
253-258	Tejon Creek Valley	X	–	X	–	X
260-290	**Mojave Line**	–	–	–	X	–
268	White Wolf fault, south of Mettler	–	X	–	–	–
260-325	Southern San Joaquin Valley	X	–	–	X	–
300	Buena Vista fault, north of Ford City	–	X	–	–	–
	Kern Lateral					
0-30	Southern San Joaquin Valley	X	–	–	X	–
8-12	White Wolf fault, south of Arvin	–	X	–	–	–
21-26	Edison fault, northeast of Edison	–	X	–	–	–
39	Mt. Poso fault, north of Bakersfield	–	X	–	–	–
39-44	Pond-Poso Creek fault, north of Bakersfield	–	X	–	–	–
43	Kern Front fault, north of Bakersfield	–	X	–	–	–
248-250	Cummings Valley and Brite Valley in Tehachapi Mountains Chanac Creek	X	–	X	–	X

- Ground subsidence resulting in enough change in elevation along a particular section of pipeline to damage the pipeline or ancillary facility. The significance of this effect would depend on the magnitude of subsidence and the interval over which the elevation change would occur.

- Landslides and debris flows that could dislodge, bury or severely damage the pipeline or ancillary facilities. These events could significantly affect the pipeline along its alignment in mountainous terrain.

- Volcanic activity leading to damage or failure of the pipeline. Significance criteria are based on the level of probability indicated by historical activity that volcanic events leading to damage or failure of the pipeline would occur.

- Wind erosion of loose materials, such as sand dunes, that are susceptible to wind erosion and could remove support from underneath the pipeline.

- Avalanche activity, such as large slab avalanches, capable of producing scour and debris zones which could uncover, cover with large volumes of material, or rupture the pipeline. High mountain areas of the Middle Rocky Mountains with annual avalanche activity are susceptible areas.

Implementation of the mitigation measures in Section 4.10 will reduce the risks associated with geologic hazards to acceptable levels.

Impacts on Geologic Environment

- New and reactivated landsliding due to geomorphic changes resulting from construction in landslide-prone areas.

- Active mining operations or proposed mineral/energy development requiring avoidance by the pipeline.

- Presence of federally controlled mineral resources which would be precluded from future development by the pipeline or ancillary facilities in highly probable production areas.

- Large-scale topographic alterations resulting in significant related impacts.

4.2.2.2 Mojave Proposal

Geology and Physiography. Construction of the Mojave Proposal would disturb the ground surface, the upper few feet of soil and/or rock material within the construction right-of-way along the entire pipeline route. In some areas it may be necessary to affect a larger area along the route, such as where cuts and fills are made. The existing topography would be altered at such cuts and fills. The geologic and geomorphic processes that operate in arid regions along the route are generally very slow; therefore, these changes could be evident for tens to hundreds of years. However, these potential impacts of pipeline construction are not considered to be significant.

Seismicity and Faulting. A number of geologic hazards associated with the active seismotectonic environment exist along the Mojave Mainline and the Kern Lateral of the Mojave Proposal. These hazards can be subdivided into two categories: strong ground shaking and surface-fault rupture. Strong ground shaking can result in one of several secondary seismic effects such as liquefaction, lurching or spreading, compaction, and landslides. These seismically related hazards are discussed in terms of the potential for serious damage to project facilities.

In general, ground shaking would be most severe close to the fault on which the earthquake occurs. Faults with the highest probability of producing damaging earthquakes include the San Andreas (near MP 280-326), White Wolf (MP 268), and Garlock (MP 234) faults.

The potential effects of strong ground shaking depend largely on the specific characteristics of the various project facilities. The buried pipeline would be least sensitive to vibratory shaking because it is flexible enough to deform with the surrounding soil. Above-ground facilities would be substantially more susceptible to vibratory damage. In general, the low compressor station MJ-1 buildings would be relatively resistant to damage. However, the compressors, piping and valves could be subject to amplified vibrations leading to possible failure.

Secondary seismic effects triggered by strong ground shaking are often more serious than the shaking itself. Soil liquefaction, lurching or spreading, and dynamic compaction are related phenomena which may occur in unconsolidated saturated soils subjected to moderate to strong ground shaking. Young alluvial fan deposits in the southern San Joaquin Valley are susceptible to these effects where they are saturated near the surface due to irrigation or shallow groundwater and are sufficiently loose. Buwalda and St. Amand [1955] document areas near the proposed mainline route in the vicinity of Mettler (MP 269) in which this type of failure occurred during the 1952 Kern County earthquake. Secondary seismic effects would be most likely to occur in portions of the upland valleys of the Tehachapi Mountains underlain by sandy alluvium that is saturated near the ground surface due to irrigation or along drainage courses and streams (MP 248-258). Due to infrequent saturation and generally favorable drainage, sandy deposits in the Mojave Desert would probably not experience damaging secondary effects. The Mojave River floodplain deposit may be an exception.

The loss of ground support or ground movement resulting from liquefaction-related behavior could result in no effect, bending, or rupture of the buried pipe depending on specific site conditions. Rupture is likely only if a large deflection of the pipe occurred. The boundaries between liquefied and unliquefied soil are particularly hazardous locations.

Moderate to strong ground shaking can trigger renewed movement or enlargement of existing landslides and induce new failures. In this situation, the pipeline could be lifted and sheared. The risk of this type of failure and the potential effects on the pipeline are discussed in the following section on slope stability. Slope instability triggered by strong ground shaking may occur locally on the steeper flanks of the Tehachapi Mountains (MP 230-252). Most of the remainder of the proposed mainline route would not be threatened by this hazard.

The second important seismic hazard involves surface-fault rupture. Although it is difficult to quantify the probability of surface fault rupture, it is generally accepted that the more recently a fault has moved, the more likely it is to move again in any given period of time.

Of the Quaternary faults listed in Tables 3.1-6 and 3.1-7, the Garlock fault (MP 234) is considered to be reasonably capable of causing offset of an extent sufficient to rupture unprotected pipeline. This fault may have undergone up to six inches of offset during the 1952 Kern County earthquake [Buwalda and St. Amand, 1955]. The amount of offset resulting from a maximum credible earthquake on the Garlock fault could exceed 10 to 20 feet. Minor surface fault rupture occurred on the White Wolf fault at the mainline crossing (MP 268) during the 1952 magnitude 7.7 seismic event [Jennings, 1975]. The maximum credible event for the White Wolf fault is about 7.7 [Greensfelder, 1974]. Some surface movement of faults related to the White Wolf fault also occurred during the 1952 Kern County earthquake in the area of the proposed mainline, including about six feet of horizontal offset between telephone poles [Lofgren, 1985].

The Kern Lateral route would cross a section of the White Wolf fault (MPs 5 and 8) where surface displacement of one to ~~two~~ three feet occurred in 1952 [Lofgren, 1985]. The Edison fault (MP 21-26) also had surface fault rupture during the 1952 earthquake [Jennings, 1975]. ~~The Kern Lateral route would cross the White Wolf fault where surface rupture did occur in 1952 (MP 8). Amount of surface rupture was up to three feet [Lofgren, 1985]~~

Two faults in the central Mojave Desert, Manix fault and a splay of the Emerson fault, show evidence of Holocene and historic surface rupture [Beebey and Hill, 1975; Keaton and Keaton, 1977; Hawkins and McNey, 1979; Hill et al., 1980]. Neither of these faults would be crossed by the proposed mainline route, but they have similar geologic characteristics to faults which would be crossed by the mainline. Available evidence suggests that impacts to the proposed pipeline due to movement of these faults could potentially be significant.

The faults with similar geologic characteristics which would be crossed by the proposed Mojave Mainline include the Ludlow (MP 98), Pisgah (MP 120), Calico (MP 142), Harper (MP 152), Lockhart (MP 165), and South Lockhart (MP 180) faults [Jennings, 1975]. These faults range in length from 50 to 100 miles, and based on their length, displacement in the range of 5 to 10 feet is possible [Slemmons, 1977]. The actual earthquake magnitudes and amounts of displacement that might occur along individual faults are not known. Evidence of fault creep has been observed on the Lockhart Fault about five miles southeast of the proposed mainline crossing site [Jennings, 1975].

Slope Stability. The risk of damage to the Transfer Line, the Mainline, and the Kern Lateral from natural slope instability is low due to the generally favorable climatic, geologic, and geomorphic conditions along the proposed routes. In the Tehachapi Mountains and on locally steep slopes along the mainline, slides may occur due to above-normal rainfall, seismic shaking, construction grading, or other natural or man-related causes. Failure may occur due to shearing of the pipeline from differential movement of the ground, loss of support due to movement of material from beneath the pipe, or crushing of the pipe by overriding rocky soil. The length of the proposed mainline route subject to this hazard is relatively small, and proper geotechnical design would result in relatively low risk of these types of hazards. Stabilization, monitoring, and other remedial measures may be necessary where landslide crossings are unavoidable.

Subsidence. Three types of land subsidence are actively occurring along the proposed mainline and the Kern Lateral in the southern San Joaquin Valley: 1) subsidence due to groundwater withdrawal, 2) pumping subsidence associated with oil field development and the withdrawal of oil and gas, and 3) subsidence due to the hydrocompaction of collapsible soils [Lofgren, 1985]. The subsidence due to oil and water withdrawal would probably not be of serious concern with respect to the proposed routes. However, the hydrocompaction potential is significant, especially between the area located six miles east of Maricopa to Elk Hills (MP 290-312) and the area located west of Mettler (MP 270-280). Up to five feet of differential subsidence can be expected in this area [Lofgren, 1985]. Detailed mapping of the areas prone to hydrocompaction and remedial practices are discussed by Lofgren [1975]. Hydrocompaction subsidence conditions may exist in portions of the Mojave Desert; however, the significance of the problem in this area would not be as great as in the San Joaquin Valley [Lofgren, 1985] due to the lower levels of ~~groundwater withdrawal~~ surface wetting.

Unique Geologic Features. The risk of damage from renewed volcanic activity at the Pisgah or Amboy volcanic fields is judged to be low. Sand dunes located along the proposed route have the potential to migrate, uncovering the pipeline and removing support from beneath. No ~~other~~ significant impacts on or from unique geologic features are anticipated.

Flooding. The proposed Mojave Transfer Line would cross a number of arroyos on alluvial fans in the segment located from MP 1 to MP 16. Portions of the proposed Mojave Mainline are subject to flash flooding within the Mojave Desert. The Mojave River near Barstow (MP 136.6) has been zoned as a flood-prone area by the San Bernardino County Flood Control District. Flash flooding in this area could potentially result in significant adverse impacts on the pipeline.

Mineral/Petroleum Resources. No significant adverse impacts to current development or planned extraction of mineral or petroleum resources are expected to result from implementation of the Mojave Proposal. The mainline route would not traverse properties of mineral producers or highly probable production areas as identified by the BLM [1980]. The proposed Mojave Mainline would cross leasable mineral resource areas on federal land; therefore, mineral development and mining could encroach on the proposed mainline. If necessary, rerouting or redesign of the affected portion of the Transfer Line or the Mainline could be implemented to provide access to these resources.

4.2.3 Soil

Impacts to soils would be considered significant if increased erosion rates or reductions in soil productivity resulting from project activities would prevent successful rehabilitation and eventual vegetation regeneration. Evaluations of successful rehabilitation are based on whether soils having erosion or reclamation constraints would stabilize to near preconstruction erosion conditions and support pre-existing land uses within a few years following application of proposed plans and compliance with federal stipulations for erosion control and revegetation.

Proposed construction would alter and disturb soil within the pipeline right-of-way and at surface facility sites. These impacts would include loss of topsoil, including mixing of topsoil with less suitable subsoil material; removal of vegetative cover and/or disturbance of desert pavement in arid areas resulting in accelerated soil erosion; soil compaction; and reduction in soil productivity. These impacts would affect runoff, water erosion, sediment yield, wind erosion, and soil stability, as well as affect the soil as a medium for plant growth.

Impacts to soils would result primarily from an increased susceptibility to erosion or displacement. The degree of susceptibility to erosion would vary according to soil erodibility characteristics, topography, surface roughness, and the presence or absence of protective soil cover such as vegetation, plant residues, gravel, cobble, or rock. The amount of erosion would be related to the time between the disturbance and re-establishment of vegetation or implementation of erosion control measures. Soil productivity could be reduced by either the loss of topsoil or the mixing of topsoil with substratum materials excavated from the trench that are less suitable or unfavorable for plant growth because of nutrient imbalances or deficiencies, salinity/ alkalinity, rock fragments, sand, clay, or unweathered bedrock.

In addition to the above impacts related to increased erosion or reduced productivity, some croplands will also be impacted by disruption of irrigation systems as well as surface and subsurface drainage systems.

Indirect impacts to soils would possibly include the disturbance of reclaimed and stabilized portions of the ROW accessed by off-road vehicles. This type of potential disturbance would take the form of vegetation loss, soil destabilization, and increased erosion (rilling and gullying) and/or soil compaction.

Impacts were analyzed for three impact categories: water erosion potential, wind erosion potential, and reclamation potential. The Universal Soil Loss Equation was used to estimate water erosion on specific soil units which may include soil mapping units, soil series, or slope phases depending on the level of detail of information on soils in a given area. These estimates were made for a freshly topsoiled and seeded condition. The range in estimated erosion was divided into classes of low, moderate, and high (see footnote at bottom of Table 4.2-6). Each soils unit was assigned an erosion potential class. The total distance that the pipeline would traverse in each erosion class was summed for each geographic region to obtain cumulative miles of soils traversed with low, moderate, and high erosion potential.

Wind erosion potential classes were defined based on wind erodibility groups, wind erosion potential, and/or the texture of the surface soil horizons for each soil unit presented in the published and unpublished soil surveys. Cumulative distances of soils in each wind erosion potential class were similarly obtained as presented for water erosion potential.

Reclamation potential was assigned to each soil unit using six criteria including average annual precipitation, dominant slope gradient, depth to bedrock, salinity, soil texture, and coarse fragment content. Cumulative distances of soils in each reclamation potential class were similarly obtained as presented for water erosion potential.

The soil units which served as the basic unit of soil information range in width from 0.1 to over 10 miles. These units or groups of units typically are distributed in repeating sequences. Consequently, the specific or basic data base used and the water and wind erosion potential calculations, and reclamation assignments for these units would be too voluminous to be presented in this document. Thus, these units have been aggregated into soil associations and their distribution and character presented in Appendix A. General locations of areas with poor reclamation potential, high water erosion potential, or wind erosion potential may be found in this appendix. The distribution of potential soils impacts is presented in Table 4.2-6. Summary descriptions of soils impacts are presented below.

4.2.3.1 Mojave Transfer Line

The probability for significant water erosion is evenly distributed from low to high on most of this line, which would lie within the Mojave Desert region. The probability for significant wind erosion is mostly high and the dominantly poor reclamation potential indicates potential for significant revegetation problems.

4.2.3.2 Mojave Mainline

4.2.3.2.1 Mojave Desert (MP 0-228)

In the Mojave Desert region, the probability for significant water erosion is low and the probability for significant wind erosion is high. The dominantly poor reclamation potential indicates potential for significant revegetation problems.

4.2.3.2.2 Tehachapi Mountains (MP 228-256)

In the Tehachapi Mountains, the probability for significant water erosion is high on mountainous slopes and low in valleys. The probability for significant wind erosion is moderate. The dominantly poor reclamation potential indicates significant revegetation problems.

4.2.3.2.3 San Joaquin Valley (MP 256-325)

In the San Joaquin Valley the probability for water erosion is low, and the probability for significant wind erosion is low to moderate. The dominantly good reclamation potential indicates potential that significant revegetation problems are unlikely.

4.2.3.3 Kern Lateral

The probability for significant water erosion is low along this route segment within the San Joaquin Valley, with a lesser amount of moderate and high probability on short segments of steeper slopes. The probability for significant wind erosion is ~~mostly~~ low to moderate. The dominantly good and fair reclamation

Table 4.2-6

DISTRIBUTION OF POTENTIAL SOILS IMPACTS, MOJAVE PIPELINE PROPOSAL

		Erosion Potential 1/						Reclamation Potential 2/		
		Water (miles) 3/			Wind (miles) 3/			(miles) 3/		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
Transfer Line										
0.0-16.5	Mojave Desert	5.0	6.5	5.0	5.0	0.0	11.5	0.0	3.0	13.5
Mainline										
0.0-228.0	Mojave Desert	224.0	3.0	1.0	1.0	50.0	177.0	6.0	40.0	182.0
228.0-256.0	Tehachapi Mtns	7.0	5.0	16.0	1.0	24.0	3.0	3.0	6.0	19.0
256.0-325.0	San Joaquin Valley	62.0	5.0	2.0	13.0	54.0	2.0	63.0	3.0	3.0
Kern Lateral										
0.0-45.0	San Joaquin Valley	30.0	9.0	6.0	20.0	20.0	5.0	27.0	11.0	7.0

1/ Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

2/ Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use, productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

3/ Cumulative miles for pipeline segment.

potential indicates potential that significant revegetation problems are unlikely.

4.2.4 Surface Water

The following itemization of pipeline component specific impacts to perennial streams is primarily based on a stream sensitivity rating. The sensitivity of streams and rivers to pipeline construction is based on the channel gradient and the gradient of the topographic sideslopes in combination with the width of the floodplain. Streams were given a low rating if channel gradients were less than one percent and had sideslope gradients less than five percent or had floodplains greater than 50 feet on a side; a moderate rating if channel gradients were between one and three percent and had sideslopes between five and 20 percent; and a high rating if channel gradients were greater than three percent or had a sideslope greater than 20 percent. The higher the sensitivity, the greater the chance that significant impacts would occur.

Construction of the pipeline through flowing perennial and intermittent stream channels would likely result in two types of impacts: the dislodging and subsequent increased transport of channel bed sediments and the alteration of the channel bed configuration and bed material. Alteration of the channel bed could cause disruption of the tenuous balance between stream discharge, amount and kinds of sediment transported, and the size of sediment making up the channel bed, resulting in aggradation and degradation of the channel. Both resultant impacts could constitute significant impacts to water quality and stability of the stream environment unless appropriate mitigation measures are implemented. Pipeline construction through ephemeral channels would increase the amount of available and easily entrained sediment during flows; however, this impact would not be considered significant. Streams may be further subjected to construction impacts if subsurface water contained in alluvium is affected.

Impacts to surface water resources that would occur due to pipeline construction, operation and abandonment are classified ~~as significant~~ using criteria derived from government regulatory standards, available scientific documentation, previously prepared EISs and the professional judgement of resource specialists. The following criteria were used to delineate significant impacts to surface water resources:

- o Degradation of water quality to the point that it does not meet all existing state and federal standards.
- o Modification of quantity or quality of stream flow caused by water withdrawals, instream construction or accidental contamination to the extent that water used by established

users is measurably reduced or that critical aquatic habitats support reduced fish populations.

- o Alteration of channel geometry or gradients such that undesirable effects such as aggradation, degradation, or side cutting occur.
- o The location of permanent above-ground facilities within the 100-year floodplain.
- o Downstream sedimentation affects the operation of irrigation water control structures.

Impacts that would occur to surface water resources due to pipeline construction generally fall into three categories: increased surface runoff, erosion, and off-site sedimentation resulting from clearing of the right-of-way; construction through streams and rivers; and the withdrawal and discharge of water associated with hydrostatic testing of the pipeline.

Construction activities within the right-of-way would increase surface runoff, erosion, and subsequent off-site sedimentation. The potential and magnitude of increase would be proportional to inherent erodibility of the soil. Erosion is discussed in the soils section above. Depending on the size of contribution area upslope, a substantial quality of sediment could be transported downslope especially if the trench were left open during a precipitation event and served as a runoff concentrator. This could be a common event due to summer thunderstorms in the project area. Should an increase in runoff, erosion, and sedimentation occur adjacent to a stream channel, the increase in sediment loading to the stream environment in turn would cause a degradation of water quality and could constitute a significant impact if the stream had good water quality initially. In mountainous terrain where unstable slopes are common, an increased additional potential for stream sedimentation caused by mass failure of earth materials may occur. Slope stability is discussed in the geology section above.

Construction of the pipeline through flowing perennial and intermittent stream channels would likely result in two types of impacts: the dislodging and subsequent increased transport of channel bed sediments, and the alteration of the channel bed configuration and bed material. Alteration of the channel bed could cause disruption of the tenuous balance between stream discharge, amount and kinds of sediment transported, and the size of sediment making up the channel bed, resulting in aggradation and degradation of the channel. Both resultant impacts could constitute significant impacts to water quality and stability of the stream environment unless appropriate mitigation measures are implemented. Pipeline construction through ephemeral channels would increase the amount of available and easily entrained sediment during flows; however, this impact would not be considered significant. Streams may be further subjected to construction impacts if subsurface water contained in alluvium is affected.

Depending on the location and discharge of the water body utilized as a source of water for hydrostatic testing, the withdrawal of water in large quantities could significantly reduce natural flows such that instream water uses and downstream water uses could be impacted. Withdrawal rates could be as high as 7 cubic feet per second (cfs). Generally, water withdrawal would last for a very short period of time. However, if substantial dewatering occurs such that downstream water uses or instream uses were ~~impacted~~ adversely affected, the impacts would be considered significant. The indiscriminant discharge of water used for hydrostatic testing could negatively impact surface water quality if residual chemicals associated with welding, construction machinery, or pipeline coating were transported with the water and discharged into or near a stream. Erosion of earth materials could occur if the discharge water was allowed to scour unprotected soils. Discharge rates could be as high as 5 cfs. The impacts associated with hydrostatic test water discharge would not be significant if appropriate mitigation measures identified in Section 4.10 were implemented.

4.2.4.1 Mojave Transfer Line

No significant water resources would be affected by the construction, operation, and abandonment of the Mojave Transfer Line.

4.2.4.2 Mojave Mainline

Most of the Mojave Mainline would traverse ephemeral to intermittent streams. However, the proposed route would cross the Colorado River near Topock, Arizona. Since plans for construction entail suspending the pipeline over the river on the old U.S. Highway 66 bridge, no significant impact on the Colorado River would result from construction, operation, and abandonment of the pipeline.

The proposed Mojave Mainline route would also cross the Mojave River downstream from Barstow, California. The pipeline would be buried below the channel bottom at a depth below estimated scour. If the Mojave River were flowing during the construction phase, an unlikely event, an increase in sediment load and subsequent decrease in water quality would be expected downstream. This would occur only for a short period of time and would result in no long-term adverse effects since the river normally contains high sediment loads. If the river were dry during construction, sediment loading would not be of concern.

Water quality in the Mojave River could be affected during construction if an accidental spill of construction chemicals, lubricants, or fuels occurred. A spill of this type could potentially contaminate alluvial wells located downstream if the river were flowing. The potential for contamination is low due to the fact that the greatest number of wells are located upstream from the proposed pipeline crossing and that any such spill would be of relatively small volume.

Numerous ephemeral to intermittent channels would be crossed. No significant impacts are expected assuming that prudent design and construction are implemented. The several canals and aqueducts are not expected to be crossed in a way that would significantly impact their flow capacities.

Poso Creek, a major intermittent to perennial stream, ~~could be adversely affected since the pipeline would not be located on its floodplain--near--the--channel.-----A~~ would be paralleled for approximately 3.3 miles. ~~of the creek would be paralleled.~~ The resulting disturbance within the floodplain could be as high as 40 acres. ~~Thus, the potential of~~ However, no significant impact would ~~be great~~ occur if proper erosion control measures are implemented. Poso Creek is primarily intermittent in the vicinity of the proposed construction and much of its flow originates as waste water from Oildale.

4.2.4.3 Kern Lateral

The proposed Kern Lateral would cross only one major perennial stream, the Kern River. Potential impacts would be similar to those described for the Mojave River above. However, since the Kern River is perennial, construction would probably occur during flowing conditions and, consequently, there is a high potential of increasing sediment loads to the river. Downstream water users and instream flow uses could be affected. Any increase in sediment loading to the river would likely be short-term.

4.2.5 Groundwater

Potential impacts to groundwater resources that would occur due to pipeline construction, operation, and abandonment were classified as significant or not significant using criteria derived from available scientific documentation (including previously prepared related environmental impact statements) and the professional judgement of resource specialists. Impacts were considered potentially significant if:

- The depth to groundwater was shallow (<10 feet) and served as a major source of water for local industrial, agricultural, or domestic use (high potential).
- The depth to groundwater was moderate (10 to 15 feet) and local usage was high or the depth to groundwater was shallow (<10 feet) and local usage was moderate (medium potential).

- o The depth to groundwater was moderately great (50 to 100 feet) and local usage was low (low potential).

Impacts were considered not significant if:

- o The depth to groundwater was great (>100 feet);
- o Groundwater quality was sufficiently poor (total dissolved solids concentrations greater than 2,000 milligrams per liter) to preclude widespread development;
- o Groundwater usage in the area was currently low and was not anticipated to increase significantly in the future.

Potential groundwater impacts that may occur include contamination due to fuel or chemical spills and lowering or alteration of the water table. These impacts would be expected to be limited to areas in the vicinity of and hydraulically down-gradient from the pipeline within the affected aquifer. An exception would be if a significant chemical spill occurred in surface water. This contamination could be carried downstream and subsequently pollute aquifers that are not associated with the pipeline route. Areas of highest potential impact are those locations that overlie a shallow aquifer that has been extensively developed locally as a water supply. Specific measures are recommended to minimize the possibility of accidental groundwater contamination.

During excavation and installation of the pipeline, shallow aquifers could be disrupted temporarily due to dewatering. Effects from these operations would be short-term and would go unnoticed except in wells completed in the same aquifer near the pipeline.

A potential also exists that flow conditions in shallow aquifers could be altered slightly due to the presence of the trench in which the pipeline is laid. If the material backfilled into the trench ~~would~~ was significantly less permeable than the surrounding material, the trench could serve as a barrier to groundwater flow. If it was more permeable, the trench could serve as an avenue for enhanced flow. In either case, the effect would be small and localized and would occur only in those areas where the water table was above the bottom of the trenching depth. Except in extremely unusual circumstances, the trench would be backfilled with material excavated from the trench itself.

Channeling of groundwater in the backfilled trench can cause local alterations to groundwater flow patterns with possible adverse impact on slope stability and groundwater availability.

Upon abandonment, the pipeline would be purged. The purging medium would be treated to remove contaminants prior to discharge. If reasonable precautions were used, abandonment would have negligible impacts on groundwater.

Table 4.2-7

GROUNDWATER IMPACTS, MOJAVE PIPELINE PROPOSAL AND ALTERNATIVES

	Miles of Potential Impact			
Mile Post	High	Medium	Low	Comments
90, 122-141	-	20	-	Moderate depth to water, low to moderate use
157	1	-	-	Moderate to shallow depth to water, moderate use
200	1	-	-	Shallow depth to water, high use in area
260-325	-	-	65	Great depth to water, high use
KERN LATERAL				
Entire	-	-	45	Great depth to water, high use
TRANSFER LINE				
No significant impacts anticipated				
ALTERNATIVE A				
No significant impacts anticipated				
ALTERNATIVE B				
30-45	-	15	-	Moderate to shallow depth to water, low to moderate use

Nearby springs in mountainous areas could be adversely affected by blasting and excavation. Specific mitigation measures are recommended to minimize any significant impact to important springs. Specific groundwater impacts that could potentially occur due to construction, operation, and abandonment of the Mojave Proposal are summarized in Table 4.2-7. Approximately 132 miles of the route could be impacted. Only 22 of these miles would be medium or high impacts.

4.2.5.1 Mojave Transfer Line

No significant impacts to the groundwater along the proposed Mojave Transfer Line are expected as a result of constructing/ operating the pipeline.

4.2.5.2 Mojave Mainline

The potential for significant adverse impacts to groundwater along the mainline route ~~is low~~ exists.

Significant impact would result only if a major fuel or chemical spill occurred in or near a high-use shallow groundwater area such as the Mojave River crossing, North Moroc area, or portions of the Tehachapi Mountains.

Nearby springs in mountainous areas could be adversely affected by blasting and excavation. Precautionary measures are recommended.

4.2.5.3 Kern Lateral

The entire route of the Kern Lateral has a low potential of significant groundwater impact.

4.2.6 Freshwater Biology

Principal impacts on aquatic environments which would result from construction of the proposed pipeline include increased sedimentation, substrate removal, and habitat alteration. Effects of these impacts on aquatic organisms would include reduction of algae and macrophyte populations, decreased macroinvertebrate abundance, and displacement and potential reduction of fish populations [Murphy et al., 1981; Reed, 1971]. Impacts of pipeline construction would be relatively short-term and primarily related to the amount of sediments introduced into the stream, how far they are transported and the quality or importance of the aquatic resource affected.

Increased suspended sediments can decrease primary and benthic invertebrate production by siltation of benthic habitat. Fish could also be affected by increased sedimentation, which can decrease food availability (i.e., benthic invertebrates), feeding efficiency, and the amount and quality of spawning or juvenile rearing habitat. The type and quantity of sediments introduced and transported within a stream is variable, dependent upon stream gradient, bed type, hydrology, size of floodplain, steepness of sideslopes and extent of streamside vegetation.

Actual loss of habitat as a result of removal of streamside vegetation or trenching of benthic habitat would be relatively minor and would not exert a significant impact.

Impacts to aquatic communities were considered significant if:

- A pipeline crossing occurred in a Class A stream.
- A high potential for sedimentation existed at a crossing of a Class B stream.

Impacts to aquatic communities would not be considered significant if:

- A pipeline crossing occurred in a Class C, D, or U stream.
- A low to moderate potential for sedimentation existed at a crossing of a Class B, C, D, or U stream.

For purposes of impacts analysis, streams were classified as follows:

Class A	Stream area containing an excellent game fishery and/or federally listed endangered or threatened species. These streams are typically the most highly rated streams in state classifications.
Class B	Stream area containing a high quality game fishery and/or federal candidate ~~species--for--federal endangered-species-status~~ or state sensitive species. These streams are important since they normally support the bulk of fishing use within a given state.
Class C	Stream areas exhibiting a limited or moderate game fishery. Fishing in these waters is considered a secondary use.
Class D	Stream areas with few or no game fish, primarily inhabited by nongame fish. These areas are of no practical value as a fishery resource.
Class U	Stream areas with no fishery resource, typically very small perennial or intermittent streams. These streams are frequently not classified by state agencies.

Other potential impacts associated with construction of the pipeline include altered stream flow and fish mortality associated with hydrostatic testing of the pipeline. The potential for toxic fuel spills exists due to storage of petroleum products in the area during construction. Increased fishing pressure may result from increased public access into the area.

The impact of altered stream flow cannot be defined at this time as only potential sources of water have been identified and the timing of withdrawals has not been specified. The potential impact of direct fish mortality as a result of hydrostatic testing, fuel spills and increased fishing pressure would not be significant if adequate mitigation measures were initiated.

Only one perennial aquatic habitat, the Colorado River, would be crossed by the Mojave Mainline. The Colorado River supports an important aquatic community and Class A fishery resource; however, since plans for crossing the river entail suspending the pipeline from an existing highway bridge, no significant impacts to the aquatic resources of the river are expected to occur. The Kern River at Bakersfield would be crossed by the Kern Lateral, but impacts to aquatic life would be temporary and therefore not considered significant in this Class D stream.

The federally endangered bonytail chub occurs above and downstream of the Colorado River pipeline crossing. There exists a remote possibility that habitat of this species below this crossing would receive silt and turbidity from the pipeline crossing construction. This impact will likely be of short duration and not harmful to this species. A toxic and petroleum products spill in the Colorado River as a result of the pipeline projects could impact these species, but we believe the probability for this to happen is small.

Several intermittent streams including the Mojave River would also be crossed by the proposed pipeline. Pipeline construction in these areas would not significantly affect any high quality aquatic resources. Construction activities in intermittent stream channels could accelerate erosion in these channels and increase siltation rates in downstream areas. These impacts, however, would be short term and not significant due to the naturally high sediment loads of intermittent streams of the area.

4.2.7 Terrestrial Biology

4.2.7.1 Vegetation

Impacts to vegetation associated with the construction of the Mojave natural gas pipeline were classified as significant or not significant using criteria derived from governmental regulatory standards, available scientific documentation, reclamation objectives and available reclamation technology, and the professional judgement of resource specialists. The following potential impacts were considered significant:

- Removal of vegetation that, following reclamation, would not have an adequate cover of vegetation and species composition to support pre-existing land use including grazing, wildlife habitat, recreation, and agricultural operations.
- Loss or disturbance of agricultural land which lasts for one year or more, and loss of commercially valuable timber.
- Loss or disturbance of riparian zones and wetlands, as well as other communities considered to be economically important, rare, unique, or sensitive by federal, state, or local agencies or municipalities, and special interest groups.
- Reduction in numbers of individuals of sensitive plant species or disturbance of suitable habitat with or without known occurrence judged important to the survival of those species.

Impacts caused by pipeline construction and associated activities are categorized according to significance:

Class I	Significant adverse impacts that could not be mitigated or avoided.
Class II	Significant adverse impacts that could be feasibly mitigated or avoided.
Class III	Adverse but not significant impacts that could be feasibly mitigated or avoided.
Class IV	Beneficial impacts.

Denudation of vegetation along the 100-foot pipeline ROW would impact all vegetation types traversed by the pipeline routes. The duration of this loss would depend on whether large woody shrubs and trees were present in the operational ROW and the revegetation potential of a given community type. For the Mojave Proposal, it was assumed that a 50-foot wide operational ROW would be maintained by not allowing large woody shrubs and trees to re-establish within the ROW. Therefore, most vegetation loss across the 100-foot construction ROW within community types with fair or better revegetation potential not containing large woody shrubs or trees would be short term. Loss within vegetation types with fair or better revegetation potential containing large woody shrubs and trees would be long term (life of project) within the operational ROW, and short term within the balance of the construction ROW since the woody species would re-establish relatively quickly within the life of the project. Vegetation losses within vegetation types with fair or better revegetation potential would be classified as Class III impacts regardless of whether they are long term or short term losses except for the oaks in the digger pine-oak woodland type. Loss of these individuals would be considered a Class II impact since they could be avoided. The forb, grass, and shrub components of the digger pine-oak woodland would re-establish relatively quickly.

The duration of impacts associated with removal of vegetation types would vary widely with respect to the inherent revegetation potential of each vegetation type, which is generally inversely related to aridity [Vasek et al., 1975]. Revegetation of arid and semiarid communities occurring in the Mojave Desert is difficult and would require 70 years or more before a natural state is approached [Lathrop and Archbold, 1980; Vasek et al., 1975]. Loss within the following vegetation types would be considered a Class I impact: Joshua tree woodland, Mojavean creosote bush scrub, Mojavean juniper woodland and scrub, desert saltbush scrub, Sacramento/Stepladder Mountains teddybear cholla Unusual Plant Assemblage (UPA), and western Mojave Desert Mojave saltbush UPA [BLM, 1980]. Loss of these types would be considered a permanent Class I impact. Loss within the wetland/riparian, digger pine-oak woodland, and agricultural land types would be considered a Class II impact. Loss within the valley and foothill grassland type would be considered a Class III impact. The loss of individual Joshua trees (Joshua tree woodland), blue oaks (digger pine-oak woodland), and valley oaks (digger pine-oak woodland) would be considered Class II impacts since they could be mitigated by avoidance and/or transplanting in the case of Joshua trees. These species are very difficult to regenerate in the long term and loss would essentially be permanent.

The proposal, including the Mojave Transfer Line, Mojave Mainline, and Kern Lateral, would denude a total of 4680 acres of vegetation within 10 vegetation community types. Of this total, 2,830 acres of denudation would be considered a Class I impact, 1,110 acres a Class II impact, and 740 acres of Class III impact. Table 4.2-8 summarizes the loss of vegetation that would occur due to construction of each component of the proposal.

Portions of the ROW, particularly in the Tehachapi Mountains and the San Joaquin Valley, would be susceptible to the establishment of weedy and noxious plant species. Once established, the prolific and competitive nature of these undesirable species may preclude establishment of desirable species. The establishment of these undesirable species would be considered a Class II impact since measures could be implemented to effectively control or eradicate the species.

Land uses and values associated with vegetation that would be impacted as a result of ROW clearing include livestock grazing, agricultural operations, and wildlife habitat. Except for agricultural operations, these topics are discussed elsewhere in this document. Impacts to agricultural lands would include loss of existing crops and decrease in productivity of the land. With proper soil handling techniques and the timing of construction to occur during the dormant season, the loss of productivity should be short term and therefore Class II. Long-term loss may occur to vineyards and orchards since they are woody in nature and not readily replaced. However, these losses would be mitigable through direct compensation.

Impacts that would occur to plant species of special concern include direct impacts involving the death or destruction of an individual or population, and impacts involving the destruction and reduction of suitable habitat with or without the occurrence of individuals or populations. Both impacts would be considered significant since they may result in further jeopardizing the existence of the species. These impacts would be categorized as either Class I or Class II depending on the feasibility and success of implementing appropriate mitigation measures.

The ability to assess a definite impact to species of special concern depends on the level of detail available on the species. Appendix C lists all the known species of concern that may occur along the proposed routes. The red rock tarweed, Bakersfield saltbush, striped adobe lily, Tulare pseudobahia, and California jewel flower were classified as species of greatest concern since they are legally protected. Their status and general locations were presented in Table 3.1-11. Field surveys were conducted by qualified botanists in June and July, 1986 for red rock tarweed, California jewel flower, and Bakersfield saltbush along the estimated location of the proposed pipeline routes. The pipeline routes were not staked on the ground prior to the survey, thus introducing an element of uncertainty as to the actual location of the ROW. At the time of the survey, Bakersfield beavertail cactus was believed to have a high potential of being listed by the State of California. Therefore, it was also surveyed for. It has not yet been listed by the state. Similarly, at the time of the survey it was not known that the striped adobe lily and the Tulare pseudobahia would be listed by the State of California. These species were not surveyed for.

The other plant species of concern occur in the general areas that the pipeline would traverse and thus may be adversely impacted. These species were not surveyed for and thus the potential impact on these species can only be assessed based on the existing data base. The potential occurrences of these species and associated habitats are presented in Appendix C.

The following discussion presents information on Class I and II impacts only for each component of and geographic region traversed by the Mojave Proposal.

4.2.7.1.1 Mojave Transfer Line

General Vegetation. Approximately 195 acres of Mojavean creosote bush scrub would be denuded during construction of the proposed Transfer Line (Table 4.2-8). Because of the low revegetation potential of this vegetation type, its removal would be considered a significant (Class I) impact. Additionally,

Table 4.2-8

VEGETATION TYPES AND DENUDED ACREAGES, MOJAVE PIPELINE PROPOSAL

Project Component/ Geographic Region	Vegetation Type	Impact 2/ Class	Denudation 1/ (acres) Short 3/ Term	Long 4/ Term	Per- 5/ manent	Total
Mojave Transfer Line Mojave Desert	Mojavean creosote bush scrub	I	0	0	193.9	193.9
	Wetland/riparian	II	6.1	0	0	6.1
		Subtotal	6.1	0	193.9	200.0
Mojave Mainline Mojave Desert	Mojavean creosote bush scrub	I	0	0	1935.6	1935.6
	Wetland/riparian	II	6.1	0	0	6.1
	Teddybear cholla 6/	I	0	0	35.1	35.1
	Stabilized and partially Stabilized desert dunes	I	0	0	23.0	23.0
	Agricultural land	II	167.3	0	0	167.3
	Joshua tree woodland	I	0	0	174.5	174.5
	Mojave saltbush 7/	I	0	0	421.8	421.8
		Subtotal	173.4	0	2590.0	2763.4
Tehachapi Mtns.	Mojavean juniper woodland and scrub	I	0	0	48.5	48.5
	Digger pine-oak woodland	II	0	0	237.4	237.4
	Valley and foothill grassland	III	53.3	0	0	53.3
	Wetland/riparian 8/	II	0.2	0	0	0.2
		Subtotal	53.5	0	285.9	339.4
San Joaquin Valley	Agricultural land	II	379.4	0	0	379.4
	Valley and foothill grassland	III	456.8	0	0	456.8
	Wetland/riparian 8/	II	0.1	0	0	0.1
		Subtotal	836.2	0	0	836.2
Kern Lateral San Joaquin Valley	Agricultural land	II	267.9	0	0	267.9
	Valley and foothill grassland	III	231.5	0	0	231.5
	Wetland/riparian 8/	II	46.1	0	0	46.1
		Subtotal	545.5	0	0	545.5
		TOTAL	1614.6	0	3069.8	4684.6
Summary of Vegetation Type						
	Mojavean creosote bush scrub	I	0	0	2129.5	2129.5
	Wetland/riparian	II	58.6	0	0	58.6

Table 4.2-8 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, MOJAVE PIPELINE PROPOSAL

	Vegetation Type	Impact Class [2]	Denudation [1] (acres) Short Term [3]	Long Term [4]	Permanent [5]	Total
Summary of Vegetation Type (continued)						
	Teddybear cholla [6]	I	0	0	35.1	35.1
	Stabilized and partially stabilized desert dunes	I	0	0	23.0	23.0
	Agricultural land	II	814.6	0	0	814.6
	Joshua tree woodland	I	0	0	174.5	174.5
	Mojave saltbush [7]	I	0	0	421.8	421.8
	Mojavean juniper woodland and scrub	I	0	0	48.5	48.5
	Digger pine-oak woodland	II	0	0	237.4	237.4
	Valley and foothill grassland	III	741.7	0	0	741.7
		TOTAL	1614.7	0	3069.8	4684.4
Summary by Impact Class [2]						
	Class	I	0	0	2832.1	2832.1
	Class	II	873.2	0	237.4	1110.6
	Class	III	741.7	0	0	741.4
	Class	IV	0	0	0	0
		TOTAL	1614.9	0	3069.5	4684.4

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[1] vegetation loss assuming a 100-foot wide construction ROW and a 50-foot wide operational ROW.

[2] see Section 4.2.7.1 for definitions of impact classes.

[3] short-term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short term within the 50-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

[4] long-term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (50-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; loss would not be significant.

[5] permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant.

[6] Sacramento/Stepladder Mountains Teddybear Cholla Unusual Plant Assemblage [BLM, 1980].

[7] Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage [BLM, 1980].

[8] contains Great Valley mixed riparian forest.

approximately six acres of wetland/riparian vegetation occurring along intermittent drainages traversed by the proposed route would be removed during construction and would be considered a significant (Class II) impact.

Plant Species of Special Concern. One federal candidate species, the barrel cactus, is known to occur in the vicinity of the pipeline route as itemized in Appendix C. The pipeline would traverse required habitat (195 acres) of this species, thus, there is a high potential that it would be significantly impacted by construction (Class II).

4.2.7.1.2 Mojave Mainline

Mojave Desert (MP 0-228)

General Vegetation. Construction of the Mojave mainline within this region would denude approximately 2,760 acres. Of this total, 2,590 acres of denudation consisting of a Class I impact would occur including denudation within Mojavean creosote bush scrub, teddybear cholla UPA, stabilized and partially stabilized desert dunes, Joshua tree woodland, and Mojave saltbush UPA. Approximately 170 acres of Class II impact would occur including primarily the denudation of agricultural land and smaller amounts of wetland/riparian vegetation.

Plant Species of Special Concern. Within the Mojave Desert region, twelve federal candidate species, including species of concern to the CNPS and a California State listed rare species, red rock tarweed, ~~are likely to~~ may be impacted by the pipeline project. Two of these species, crucifixion thorn and Barstow wooly-sunflower, are known to occur along the pipeline route and, therefore, would be significantly impacted. The other ~~thirteen~~ ten species are known to occur in the general area of the pipeline project. Habitat (2,590 acres) would likely be traversed by the pipeline. Thus, the potential for significant impact is high for these species (Class II).

Field surveys were conducted for red rock tarweed in areas containing suitable habitat. No individuals were found along the estimated location of the proposed route. However, any seeps and springs can be assumed to be suitable habitat (>5 acres), and consequently, significant impact (Class II) could occur should suitable habitat be affected by pipeline construction.

Tehachapi Mountains (MP 228-256)

General Vegetation. Approximately 340 acres would be denuded along this segment of the Mojave mainline. Approximately 50 acres of Mojavean juniper woodland and scrub would be denuded which would be considered a Class I impact. Approximately 240 acres of Class II impact would occur due primarily to the denudation of digger pine-oak woodland. The blue oaks and valley oaks which occur in this type would essentially be irreplaceable if destroyed. In addition, less than one acre of wetland/riparian would be denuded (Class II impact).

Plant Species of Special Concern. Within the Tehachapi Mountains region, ~~four~~ seven candidate species, including species of special concern to CNPS, are known to occur in the general area of the pipeline within this region. Required habitat would be affected by the pipeline project, and therefore, a high potential for significant impact to these species exists (Class II). Included in these species are the California jewel flower, striped adobe lily, and Tulare pseudobahia, which are California State listed species. Field surveys were conducted for California jewel flower, but not the other two species, within the western foothills of the Tehachapi Mountains. It is not known whether individuals occur along this portion of the line since the survey was completed too late in the year to identify the annual species. However, this segment of the line is considered to be suitable habitat and therefore, destruction or disturbance of the habitat (53 acres) could significantly impact the species (Class II). Tulare pseudobahia and striped adobe lily populations do exist within the general region of the project area; however, it is unlikely that the species or its habitat occurs along or in close proximity to the proposed route. If individuals or populations of these species do exist along the proposed route, construction activities would be a significant impact (Class II).

San Joaquin Valley (MP 256-325)

General Vegetation. Approximately 840 acres of vegetation would be denuded due to the construction of the mainline within this region. Of this total, approximately 380 acres of agricultural land would be denuded representing a Class II impact. A small amount of wetland/riparian would be denuded where the pipeline would cross intermittent streams.

Plant Species of Special Concern. Within the San Joaquin Valley region, sixteen candidate species, including species of special concern to CNPS, would likely be impacted by the pipeline project. Only one of these species, Comanche Point layia, is known to occur along the pipeline route and would be significantly impacted by construction of the pipeline route. The other species, including the California state listed species California jewel flower, striped adobe lily, Tulare pseudobahia, and Bakersfield saltbush, are not known to occur along the pipeline route. However, suitable habitat (519 acres) could be impacted resulting in a high potential of significant impact to these species (Class II).

Field surveys were conducted for the California state listed species, California jewel flower and Bakersfield saltbush, along the pipeline route. No individuals were found except for Bakersfield saltbush~~; however~~, suitable habitat was identified. Therefore, there is a high potential that construction of the pipeline could significantly impact (Class II) these species through the loss of habitat.

4.2.7.1.3 Kern Lateral

General Vegetation. Approximately 550 acres of vegetation would be denuded by construction of the proposed lateral. Impacts to the approximately 270 acres of agricultural land within the San Joaquin Valley would be considered significant (Class II). Additionally, loss of the approximately 46 acres of Great Valley mixed riparian forest (wetland/riparian) would be considered a significant impact (Class II).

Plant Species of Special Concern. Within the San Joaquin Valley region, 16 candidate federal species, which are also of concern to the CNPS and include four California state listed species are known to occur in the vicinity of the proposed pipeline route as indicated in Appendix C. Comanche Point layia and Bakersfield beavertail cactus are known to occur within or near the proposed pipeline ROW. Habitat required by the remaining 14 species would be crossed by the pipeline. Consequently, there is a high potential for significant impacts to these species (Class II).

Based on field surveys in June, 1986, Bakersfield beavertail cactus, and California jewel flower would be significantly impacted (Class II) by construction of the proposed lateral. Bakersfield beavertail cactus individuals were found along the Kern Lateral at two locations. High quality suitable habitat (377 acres) required by this species as well as California jewel flower was identified along several segments of the lateral.

4.2.7.1.4 Summary of Impacts

General Vegetation. Of the total 4,680 acres of vegetation loss, approximately 2,830 acres of Class I impact and 1,110 acres of Class II would occur. Refer to Table 4.2-8 for a complete itemization of these losses.

Plant Species of Concern. Of the total 2,830 acres of Class I impact listed above, which would occur primarily in the Mojave Desert, 2,785 acres would include suitable habitat with or without occurrence of plant species of special concern listed in Appendix C that would be ~~permanently~~ lost for the life of the project. Based on field survey within the Tehachapi Mountains and San Joaquin Valley, approximately 950 acres of suitable habitat with and without occurrence of plant species of special concern would be denuded; however, this loss would be a short term impact since the vegetation type has a moderate to high revegetation potential. It is likely that several plant species of special concern would be negatively impacted by construction of the proposed project. Of these, the following would have the highest potential of being impacted: Barstow wooly sunflower, crucifixion thorn, California jewel flower, Comanche Point layia, and Bakersfield beavertail cactus.

4.2.7.2 Wildlife

Potential impacts to wildlife associated with the construction of the proposed natural gas pipeline can be grouped into four categories: direct impacts to individuals or populations incurred during the construction period; direct impacts to wildlife habitat; indirect impacts associated with increased access; and residual impacts associated with operation of the pipeline.

Direct impacts to individuals or populations associated with construction activities include death of animals unable to avoid construction equipment, temporary displacement of animals within the pipeline ROW, and increased stress on animals during a crucial period of their life cycle. Most of the animals that would be affected are common and abundant in surrounding habitats, have high reproductive potentials, and should recolonize the area following reclamation and natural revegetation. In most cases these would be short-term impacts. Loss, displacement, or disturbance of individual animals or populations would not be considered significant except where high interest or federal/ state listed and candidate species were affected. Loss of habitat incurred during construction of the proposed pipeline would vary from short-term to long-term depending on the revegetation potential of an area, which is generally inversely related to aridity [Vasek et al., 1975]. Since most of the habitat that would be traversed by the proposed route is widely distributed in the western United States, loss of habitat would not be considered significant except for habitat that has been identified as a critical or high priority requirement for a high interest wildlife species or represents habitat for federal or state listed threatened, endangered, or candidate species. In addition, riparian areas generally provide the greatest variety and abundance of wildlife. As such, disturbance to these communities would be considered significant, but are addressed in the vegetation section.

Indirect impacts to wildlife associated with the proposed pipeline construction would be increased use of vehicles and the presence of man in previously remote areas. Increased access could result in continual disturbance of sensitive species and degradation of habitat.

Residual impacts would include low level disturbance associated with the operation of compressor stations and periodic inspections of the pipeline that may result in loss of individuals due to vehicular contact, including aircraft.

The following criteria used to delineate significant impacts to wildlife are based on ecological principles and were derived from state and federal policies and standards, available scientific documentation, and the professional judgement of resource specialists.

- Impacts to high-interest animals, which include game animals, migratory waterfowl and raptors, were considered significant if pipeline construction activities would disturb these species during high stress periods (i.e. winter, migration, breeding and rearing) or result in a loss of greater than one percent of a local population. Raptors and sage grouse are particularly sensitive during breeding and/or nesting. Disturbance within a half-mile of sage grouse leks or raptor nests would be considered significant if it occurred during breeding and/or nesting periods.

- Impacts to habitat were considered significant if greater than one percent of a discrete unit of critical or high priority habitat of high interest animals were disturbed by construction activities. These areas include ranges necessary to sustain an animal or population during stress periods (e.g., winter, breeding and rearing grounds, or nest sites).

- Loss of individuals of any federal and/or state listed endangered, threatened, proposed, or candidate species was considered a significant impact. Disturbance that results in a reduction in recruitment to their populations was considered a significant impact.

- Loss or disturbance of designated critical habitat of listed threatened, endangered, or proposed species was considered a significant impact. Loss or disturbance of greater than one percent of habitat supporting a viable population of any federal or state listed ~~threatened, endangered,~~ or candidate species and BLM sensitive species was considered a significant impact. In addition, loss of any traditional structure or site considered an essential life history component of these species was considered a significant impact.

Impacts caused by pipeline construction and associated activities are categorized according to significance:

Class I	Significant adverse impacts that could not be mitigated or avoided
Class II	Significant adverse impacts that could be feasibly mitigated or avoided
Class III	Adverse but not significant impacts
Class IV	Beneficial impacts.

Species of special concern included animals listed as threatened, proposed, or endangered by the federal government or by any of the states traversed by the proposed pipeline. Federal candidate species were also included. Additionally, species identified as sensitive by a state governmental agency were included. The presence of species of special interest along the proposed route alignments is presented in Table 3.1-12.

4.2.7.2.1 Mojave Transfer Line

General Wildlife. Because of the proximity of the portions of the proposed alignment to the Colorado River and backwaters, several species of shorebirds, gulls, terns, waterfowl and passerines associated with water frequent the general area of concern. Construction activities associated with the proposed pipeline would disturb birds utilizing the wetland habitat. This would be a short-term disturbance and a Class III impact. Because of the relative tolerance of nesting waterfowl to disturbance and the general inaccessibility of their nests, abandonment of nests is unlikely. No rookeries are located within the area of concern. An accidental fuel oil spill into the marsh area would be a Class II impact to individuals and habitat.

Wildlife Species of Special Concern. The bald eagle, peregrine falcon, and Yuma clapper rail potentially occur within the Topock Marsh area of Havasu National Wildlife Refuge. If bald eagles or peregrines are present in the area, construction activities directly adjacent to the Colorado River and the marsh complexes would temporarily disturb them. This would be a Class III impact.

The Yuma clapper rail potentially nests within the emergent marsh vegetation adjacent to the proposed pipeline. Construction activities are not expected to disturb resident or nesting individuals. No loss of marsh habitat is expected to occur. An accidental fuel oil spill would be deleterious to individuals, active nests and habitat. This would be a Class II impact to individuals and to habitat.

The proposed route would cross approximately four miles of Havasu National Wildlife Refuge. Disturbance would be relegated to upland habitat types and would not affect wetland habitat unless there was an accidental fuel oil spill as discussed above. Loss of upland habitat is discussed below for the desert tortoise.

This entire proposed alignment crosses potential desert tortoise habitat. At present, no specific populations or tortoise densities are known for the area of concern. Because the majority of populations identified within Arizona have densities between 25-50 tortoise per square mile [Schwable, 1986], it is assumed that the potential densities within the affected area fall within this range. Construction and revegetation activities at any time of year would result in ~~loss of~~ deaths of or injured individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost by falling into the open pipeline trench. Utilizing the midpoint figure (37.5 tortoise/mi^2) for the assumed density range discussed above and a 100-foot ROW, 11 tortoise would be potentially lost through construction activities. Although detailed mitigation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the creosote bush scrub community, loss of approximately 193 acres of suitable habitat would be a Class I impact. In addition, increased off-road vehicle access along the completed ROW would increase vandalism to tortoises and long-term habitat deterioration. These are Class II impacts.

4.2.7.2.2 Mojave Mainline

Mojave Desert Region (MP 0-228)

General Wildlife. The proposed route would traverse habitat for wading birds, shorebirds and waterfowl at the Colorado River crossing. Construction activities associated with the proposed pipeline would disturb birds utilizing the wetland habitat. This would be a short-term disturbance and a Class III impact. Because of the relative tolerance of nesting waterfowl to disturbance and the general inaccessibility of their nests, abandonment of nests is unlikely. No rookeries are located within the area of concern. An accidental fuel oil spill into the marsh area would be a Class II impact to individuals and habitat.

The proposed pipeline would cross or come within 0.5 mile of nine potential golden eagle nesting areas. No active nests have presently been identified within the area of concern; however, construction activities within 0.5 mile of an active nest would be a Class II impact.

Wildlife Species of Special Concern. The bald eagle, peregrine falcon, and Yuma clapper rail potentially occur along the Colorado River at the proposed pipeline crossing. If bald eagles or peregrines are present in the area, construction activities directly adjacent to the Colorado River and the marsh complexes would temporarily disturb them. This would be a Class III impact.

The Yuma clapper rail potentially nests within the emergent marsh vegetation in the vicinity of the proposed Colorado River crossing. Construction activities are not expected to disturb resident or nesting individuals. No loss of marsh habitat is expected to occur. An accidental fuel oil spill would be deleterious to individuals, active nests and habitat. This would be a Class II impact to individuals and to habitat.

Essential California condor habitat would be traversed by approximately eight miles of the proposed route east of the Tehachapi Mountains. This area is utilized for foraging by condors. Construction activities would produce a short-term minimal disturbance of condors using the area, and would be a Class III impact. However, since the two or three remaining condors in the wild will likely be captured for the captive breeding program prior to pipeline construction [Blum, 1986], there is little likelihood of any impact to this species.

The proposed pipeline would traverse approximately 60 miles of suitable habitat of the Mohave ground squirrel. Its distribution is limited to the desert scrub habitat of the western Mojave Desert of California, particularly the creosote bush scrub and saltbush scrub communities. Construction activities would result in the crushing of individuals by construction equipment on the surface and in their burrows. Loss of individuals could be minimized, but not negated and would be a Class I impact. Other individuals may be displaced during construction, but should recolonize the affected area shortly after disturbance is terminated. This would be a Class III impact. Because of the poor revegetation potential of the desert scrub communities associated with the Mojave ground squirrel, the loss of approximately 725 acres of suitable habitat would be a Class I impact.

The Gila monster is believed to be rare in California, and loss of individuals through pipeline construction activities would affect the viability of local populations. This would be a Class I impact.

In the Mojave Desert of California, the proposed route crosses 40 miles of high density desert tortoise habitat (100-250 tortoise/mi^2), 29 miles of medium density habitat (50-100 tortoise/mi^2), and 40 miles of low density habitat (20-50 tortoise/mi^2). Construction and revegetation activities at any time of year would result in ~~loss of~~ deaths of or injured individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost by falling into the open pipeline trench. Assuming the midpoint density figures for the three described habitat densities in California (i.e. 175/mi^2, 75/mi^2, 35/mi^2) and a 100-foot ROW, 200 tortoises would potentially be lost due to construction activities. Although detailed mitigation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the vegetation communities associated with the desert tortoise, loss of approximately 2,759 acres of desert tortoise habitat would be a Class I impact. ~~This loss~~

~~includes 1,319 acres of habitat within the designated density habitats described above, and an additional 1,440 acres of suitable habitat that is not currently identified with high tortoise densities.~~ In addition, increased off-road vehicle access to identified high density tortoise habitats along the ROW would increase vandalism to tortoises and long-term habitat deterioration. These are Class II impacts.

The proposed pipeline would cross approximately two miles of desert bighorn sheep habitat and two migration corridors. Pipeline construction activities during seasonal migration would be a Class II impact to desert bighorn.

Swainson's hawks are rare, but potential nesters, within the Mojave Desert region. No active nests are currently known to exist within the area of concern; however, construction activities within a half mile of an active nest during the nesting season would be a Class II impact.

Tehachapi Mountain Region (MP 228-256)

General Wildlife. No significant impacts to general wildlife have been identified within the Tehachapi Mountains. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. California condors range throughout the Tehachapi Mountains. The pipeline comes within 0.5 mile of the northern edge of condor critical habitat at Tejon Ranch. ~~critical habitat~~. No nests or roosts have been identified within the vicinity of the proposed corridor. Impacts would be expected to be relegated to short-term disturbance with individual birds reoccupying the affected area immediately after construction is terminated. This would be a Class III impact. Routine aerial inspections of the completed pipeline pose the potential risk of aircraft/condor collisions. Loss of any individuals would be a Class I impact. These aerial inspections could also disturb any condor utilizing the immediate area (Class III impact). However, since the remaining three condors existing in the wild will likely be captured for the captive breeding program prior to proposed construction, no impact to the condor is anticipated [Blum, 1986].

San Joaquin kit fox habitat would be traversed by the last four miles of pipeline in this region; however, given the lack of recent sightings, this area is considered marginal habitat for kit fox [BLM, 1984b]. If kit fox are present and natal dens occur along the ROW, construction activities when pups are in the dens from February to late April would result in the loss of individuals due to crushing or suffocation in collapsed dens. This would be a Class II impact. Construction activities would also cause a temporary displacement of local individuals, although reoccupation of the affected area would be expected soon after construction is completed. This would be a Class III impact. Natal dens appear to be somewhat traditional, and may represent ancestral breeding sites important to the successful reproduction of the species [BLM, 1984b]. As such, loss of natal den sites would be a Class II impact. No natal dens are known to occur along this segment of the proposed alignment. Loss of this marginal habitat would be a Class III impact.

The Tehachapi slender salamander may exist along north-facing slopes within moist canyons and ravines in oak-pine woodlands, and are frequently found under rotting logs and accumulated leaf litter [SCRA et al., 1980]. The proposed pipeline crosses approximately 1.5 miles of suitable habitat for this species. Construction activities within a viable population would result in the crushing of individuals. Active individuals may also fall into the open pipeline trench and become trapped. Loss of any individuals would be a Class II impact. Because of the limited amount of available suitable habitat, any loss would be a Class II impact.

Four species of blister beetles (Morrison's, Molestan's, Moestan's and Hopping's), and the Tehachapi pocket mouse potentially occur in the western foothills. At present it is unknown whether the proposed line would traverse any viable populations, and it must be assumed that an indeterminate number of individuals of each species would be lost due to short-term construction activities. Loss of individuals would be considered a Class II impact.

San Joaquin Valley Region (MP 256-325)

General Wildlife. No significant potential impacts to general wildlife have been identified within the San Joaquin Valley region. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. The pipeline route would traverse essential condor habitat. Impacts would be the same as discussed under Mojave Desert Region.

Approximately 33 miles of blunt-nosed leopard lizard suitable habitat would be traversed by the proposed mainline on the western side of the San Joaquin Valley. Construction would result in the loss of an unknown number of individuals through crushing by construction equipment on the surface and destruction within their burrows. Some individuals may also be lost by falling into open trenches. Loss of individuals could be minimized, but not negated and would be a Class I impact. Habitat loss would be significant if revegetation efforts were to fail and weedy species were introduced which favored other lizard species and thus increased competition [BLM, 1984a]. Loss of approximately 399 acres of habitat would be a Class II impact. Increased access along the completed ROW would result in long-term habitat degradation and the potential loss of individuals through crushing by vehicles. Maintenance operations along the pipeline may also result in crushing of individuals. These are Class II impacts.

Approximately 34 miles (approximately 411 acres) of San Joaquin kit fox suitable habitat occur along the proposed route along the western side of the San Joaquin Valley. One active natal den and 55 diurnal dens are known to occur within the area of concern. Significant impacts to kit fox are discussed under the Tehachapi Mountain Region.

The giant kangaroo rat occurs in grassland habitat of the valley floors along the west side of the San Joaquin Valley. Ground surveys identified 15 active colonies in the vicinity of the proposed pipeline between the California Aqueduct and the terminus of the proposed line west of the South Belridge Oil Field. The proposed alignment would cross approximately 25 miles of suitable giant kangaroo habitat (approximately 300 acres). Because giant kangaroo rats are strictly nocturnal and spend the daytime in shallow burrows, they would be highly susceptible to construction activities that would collapse burrows resulting in the loss of individuals. This would be a Class II impact. Some colonies are concentrated in small areas of suitable habitat, and it is conceivable that local populations could be decimated. Habitat disturbance may have a beneficial impact (Class IV) by removing shrubs creating the open habitat preferred by this species. A permanent ROW would provide additional barren areas that would be used by kangaroo rats for dust baths and loafing.

The short-nosed kangaroo rat range from the western foothills east to the California Aqueduct. The proposed route would traverse approximately 34 miles of this range (approximately 410 acres). Ground surveys during June-July 1986 did not identify any active burrows along the proposed route. This kangaroo rat digs shallow burrows in friable soils that are susceptible to collapse from the weight of heavy equipment. They are weak diggers and if trapped in a collapsed burrow would have little chance of escaping. Because they are strictly nocturnal, daytime construction activities would be certain to trap individuals within their burrows. Losses would be minimal because of the limited occurrence of this species along the proposed route; however, any loss would be a Class I impact. Clearing of vegetation along the ROW would be a Class IV impact by reducing shrub cover and providing more of the open habitat type preferred by this species.

Suitable habitat for the Tipton kangaroo rat is limited along this alignment to approximately two miles described by Williams [1985] as potentially supporting this species. Construction activities would result in the loss of individuals residing within the ROW. These animals dig shallow burrows in friable soils that are susceptible to collapse from the weight of heavy equipment. They are weak diggers and if trapped in a collapsed burrow would have little chance of escaping. Because they are strictly nocturnal, daytime construction activities would be certain to trap individuals within their burrows. Losses would be minimal because of the limited occurrence of this species along the proposed route; however, any loss would be a Class I impact. Clearing of vegetation along the ROW would be a Class IV impact by reducing shrub cover and providing more of the open habitat type preferred by this species.

The proposed route would traverse approximately 34 miles of Nelson's antelope squirrel range from the vicinity of the California Aqueduct north to its terminus. Ground surveys during June-July 1986 recorded 23 squirrels along this segment of the proposed route. Construction activities would disturb this species and there would potentially be a few individuals that would be crushed in their burrows by heavy equipment operations. However, this species is diurnally active and highly mobile, and would, in most cases, be able to avoid construction hazards. Loss of individuals could be minimized, but probably not negated, and would be a Class I impact. Construction disturbance may cause a temporary displacement of individuals, although they are expected to return soon after the construction phase is completed. This would be a Class III impact. Reduction of shrub cover would result in the loss of natural habitat for this species, a Class II impact. However, observations during ground surveys of the proposed route and observations by Williams [1980] indicate that a moderate amount of soil disturbance may actually create improved habitat conditions by providing additional burrow sites. As such, this would be a Class IV impact.

The San Joaquin pocket mouse potentially occurs within the affected area. At present, it is unknown whether the proposed route would traverse any viable populations, and it must be assumed that an indeterminate number of individuals would be lost due to construction activities. Loss of individuals would be a Class II impact.

4.2.7.2.3 Kern Lateral

General Wildlife. No significant impacts are expected to occur as a result of pipeline construction and operations.

Wildlife Species of Special Concern. The pipeline route would traverse essential condor habitat. Impacts would be the same as discussed under the Mojave Desert Region.

Approximately ten miles of suitable San Joaquin kit fox habitat is present along the proposed route; however, the kit fox is not limited to this suitable habitat and may occur anywhere along the route where natural vegetation communities are present. Significant impacts to kit fox are discussed under the Tehachapi Mountain Region. Loss or disturbance of suitable habitat due to construction would be approximately 121 acres.

Approximately ten miles of blunt-nosed leopard lizard suitable habitat would be traversed by the proposed lateral. Significant impacts to blunt-nosed leopard lizards are discussed under the San Joaquin Valley Region. Construction activities would result in the loss or disturbance of approximately 121 acres of suitable habitat.

The San Joaquin pocket mouse potentially occurs within the affected area. At present, it is unknown whether the proposed route would traverse any viable populations, and it must be assumed that an indeterminate number of individuals would be lost due to construction activities. Loss of individuals would be a Class II impact.

4.2.7.2.4 Summary of Significant Impacts

The following section summarizes significant wildlife impacts that have been previously addressed under the separate geographic regions. An abbreviated form is presented in Table 4.2-9.

Table 4.2-9

SIGNIFICANT WILDLIFE IMPACTS,
MOJAVE PIPELINE PROPOSAL

Wildlife Class	Impact to 1/ Individuals	Impact to Habitat
Waterfowl	16 miles (II) 2/	Undeterminable acreage (II)
Raptors	45 miles potential nesting (II)	None
Species of Special Concern 3/	169 miles (I) 27 miles (II)	2,759 acres (I) 430 acres (II) 1 kit fox natal den (II)

1/ Impacts to individuals are quantified by cumulative miles of proposed pipeline where impacts would occur.

2/ Indicates impact class: I= Significant adverse impact that could not be mitigated or avoided; II= Significant adverse impact that could be feasibly mitigated or avoided.

3/ Species of Special Concern include all federally listed species, candidates for listing, state listed species and BLM sensitive species. Because of the speculative nature of impacts to California condors, they have been excluded from this category.

General Wildlife. Approximately 16 miles of proposed pipeline ~~runs adjacent to~~ would be located in desert habitat at least 0.5 mile from the marsh areas along the Colorado River. In the unlikely chance that a fuel oil spill occurred within this area, waterfowl, wading birds and shorebirds would be significantly impacted. Individuals could be debilitated, active nests lost and habitat resources contaminated. Acreage affected would depend on the amount of fuel oil dumped. This would be a Class II impact.

Nine potential golden eagle nesting areas are crossed by approximately 45 miles of the proposed pipeline. Disturbance ~~during nesting~~ of an active nest or nesting individuals would be a Class II impact.

Wildlife Species of Special Concern. The California condor is an extremely rare species that potentially occurs along approximately ~~170~~ 140 miles of the proposed route. Because the three remaining condors in the wild are expected to be captured for the captive breeding program [Blum, 1986], it is unlikely that construction activities would impact condors. However, if a condor was killed due to operational procedures, it would be a Class I impact.

The proposed pipeline would cross approximately 183 miles of identified habitat for species of special concern, excluding the California condor. All but about six miles of this identified habitat occurs within the Mojave Desert Region and San Joaquin Valley Region. Construction activities along approximately 169 of these miles would be Class I impacts resulting in the loss of desert tortoise, blunt-nosed leopard lizards, Mohave ground squirrels, Nelson's antelope squirrels, Tipton kangaroo rats and short-nosed kangaroo rats. A good portion of this total (approximately 120 miles) overlaps pipeline miles that would involve Class II impacts.

Construction activities along an additional 14 miles of the proposed route would disturb Tehachapi slender salamander habitat, giant kangaroo rats, desert bighorn sheep migration, and San Joaquin kit fox. Disturbance or loss of individuals along these 27 miles would be a Class II impact. In addition there would be an unquantifiable loss of Tehachapi pocket mice, San Joaquin pocket mice, and four species of blister beetles. This would be a Class II impact.

Disturbance of approximately 2,952 acres of desert tortoise and Mohave ground squirrel habitat would be a Class I impact due to the poor revegetation potential of the sites.

Disturbance of an approximate cumulative total of 430 acres of Tehachapi slender salamander, blunt-nosed leopard lizard, and Nelson's antelope squirrel habitat would be a Class II impact.

One active San Joaquin kit fox den and the potential for others occurs within the area of concern. Loss of natal dens would be a Class II impact.

4.2.7.3 Grazing

Potential impacts to grazing were judged significant if lost grazing opportunity would reduce livestock carrying capacity on an allotment traversed by the proposed pipeline. For the purposes of this EIR/EIS, a loss of five percent of the grazing opportunity for an allotment during a short-term (construction phase) or long-term (operational phase) period was considered significant. Because stocking rates for allotments are nearly always based on a forage per acre basis, comparison of the percent of AUMs affected would assess potential impacts to all allotments on an equal basis. The five percent level represents the best estimate of the lowest relative portion of an allotment that could be temporarily (<3 years) lost without requiring permanent reductions in livestock stocking rates.

A significant level of impact for a given allotment could be reached in the following ways:

- o Direct ROW disturbance to five percent or more of an allotment.
- o Temporary splitting of an allotment by fences erected to allow revegetation or to avoid soil erosion thereby isolating a portion of the allotment greater than five percent or separating livestock from important water sources.
- o Elimination of grazing for three to five years on the allotment or pasture affected if building fences were impractical or would create additional impacts.

Assessment of impacts to grazing within the areas of concern included the following assumptions: 1) all of the ROW would be lost to grazing for at least three years while revegetation occurred; 2) livestock containment facilities would not be affected once the proposed action was completed; 3) no new access would occur to the allotments or associated pastures; 4) efforts to revegetate the ROW with native or naturalized species would be reasonably successful during grazing; and 5) any loss of grazing on private land would be successfully mitigated between the private land owner and the developer.

These assumptions are based on operating procedures proposed by the developer or standards for operation of federal land management agencies. The FS and BLM may stipulate specific management actions, such as fencing of the ROW for several years, to assure that revegetation is successful on a case by case, allotment by allotment basis.

Based on the first criterium for significant impacts listed above, no significant impacts to grazing were noted along the route of the Mojave proposal. However, some adverse impacts to grazing may occur to several allotments as a result of construction and operation of the proposed project. It is not possible to predict where these potential or minor adverse impacts would occur prior to staking the ROW. Adverse impacts include introduction and spreading of noxious weeds, separation of livestock from developed water sources, changes to normal trailing patterns and loss of forage (<5 percent).

4.2.8 Socioeconomics

This section presents the socioeconomic impacts of the proposed projects and their variations. The impacts of the projects on the following variables are quantified:

- o Local area population,
- o Employment and income,
- o Tax receipts,
- o Affordable temporary and permanent housing,
- o Public services and utilities, and
- o Property values.

The impacts of the projects are presented for the counties and cities profiled in the Affected Environment sections. Impacts are expressed both in nominal terms and relative to the existing condition.

Once impacts are assessed, it is important to understand whether the impacts are significant. Significant impacts require mitigation, while insignificant ones do not. Impacts on the affected variables are determined to be significant and requiring addressing, if they meet the following criteria:

1) Population in any county or city changes by 10 percent or greater.

2) Employment in any industrial sector changes by 25 percent or greater or total employment changes by 10 percent or greater.

3) Local area personal income or wages and salaries change by 10 percent or greater.

4) Demand for affordable temporary housing causes vacancy rates to become less than 5 percent.

5) Demand for permanent housing cannot be met without causing a decrease in vacancy rates below 5 percent or cannot be met through new construction within six months.

6) Local tax bases change by 10 percent or greater.

7) Public service demand exceeds supply.

8) Any property values are affected temporarily by 10 percent or greater or permanently in any way.

The estimation of the population, employment, income, public service and utilities, and housing impacts is a relatively straightforward procedure. First, the workforce required to construct and operate the project is determined. The local purchases of goods and services by the pipeline construction contractors and the workforce are also quantified. These purchases result in secondary employment impacts.

The degree to which the primary and secondary employment of non-local people who move into the area is determined. In addition, an estimate is made of the number of dependents who accompany the inmigrant workers. The sum of the nonlocal inmigrant workers and their dependents is the total population change.

Demands for public services are estimated from two sources: the demand from the proposed projects and the demand from the new population. Project demand is determined from data on the construction and operation requirements of the project. Demands from the new population are based on existing per capita usage factors in the local area.

The impacts of the projects on social service programs will be negligible due to the fact that these programs assist low income and disabled persons. The inmigrant population will be neither low income nor disabled and will therefore not qualify for public assistance. There is expected to be some reduction in local residents' reliance on social service programs because of local hiring; however, for the most part this will be temporary in nature.

Estimates are made of the number of housing units from both the permanent and temporary housing supplies that will be demanded by the inmigrant population. This determination is based on their income levels, the availability of housing, and the distance between the project site and the community.

Housing and public service demands are compared to existing supply to determine is shortfalls will result, and if so, for how long. Population, employment, and income impacts are judged against the significance criteria to determine if the projects will result in changes in the characteristics of the affected cities and counties. If the impacts are significant, the duration of the changes are specified to determine if the local area is likely to experience a "boom-town/bust-town" phenomenon.

4.2.8.1 Population, Housing, and Economic Impacts

Mojave Pipeline Company proposes to construct a 389-mile natural gas pipeline from Mohave County, Arizona, to Kern County, California. Construction will include one 22,500 hp natural gas powered compressor station and one dual inlet meter near Topock, in Mohave County, Arizona, and 17 to 24 sales meter stations in Kern County, California. For the purposes of this analysis, 20 sales meter stations in Kern County have been assumed.

The pipeline will be constructed using five spreads as follows:

1) Mojave Transfer Line, Mohave County - 17 miles
2) East Spread, San Bernardino County - 114 miles
3) Central Spread, Kern & San Bernardino Counties - 109.5 m.
4) West Spread, Kern County - 99 miles
5) Kern Lateral, Kern County - 40 miles

In addition to the five pipeline spreads, construction crews will be used to install the meter stations and the compressor station.

The socioeconomic impacts from the Mojave proposal are minimal. Positive contributions to local tax bases will occur, particularly in Mohave County, Arizona. Housing demands will be met by existing supply. The largest demand for housing, relative to existing supply, will occur to RV spaces in the Bakersfield area, where demand will constitute 37 percent of supply. Economic impacts in terms of income and employment are minimal compared to the existing infrastructure of the study region.

Table 4.2-10 presents aggregate socioeconomic impact information for the five pipeline construction spreads and the two on-site construction crews for the meter stations and compressor station. Information for the table was provided by the Mojave Pipeline Company. Local expenditures by contractors were not specifically provided in the capital costs estimates. However, in keeping with a worse case scenario, all possible local purchases were assumed. As shown in Table 4.2-10, even with this expansive assumption, very little of the materials used to construct the pipeline or other facilities are to be purchased in the local economy; the vast majority are imported into the region, having no local economic impact.

According to data provided by the Mojave Pipeline Company, construction crews will total 1,545 workers for the five pipeline spreads in the Mojave proposal. There will be an additional 227 workers used to construct the sales meter stations in Kern County and the Compressor/Dual Inlet Meter Station in Mohave County. At this time it is anticipated that the construction crews will be comprised of 65 percent nonlocal and 35 percent local labor. In general, the local labor hired onto the crews are of generic skill types or unskilled labor. The skilled labor and special trades workers generally move around the country working on particular projects. Examples of the local labor hired might

Table 4.2-10

AGGREGATE SOCIOECONOMIC IMPACT INFORMATION, MOJAVE PIPELINE PROPOSAL

Characteristics	Transfer Line	East Spread	Central Spread	West Spread	Kern Lateral	Meter Stations	Compressor Station
Location	Mohave	San Ber.	Kern/San Ber.	Kern	Kern	Kern	Mohave
Length (miles)	17	114	109.5	99	40	n/a	n/a
Construction duration (days)	60	225	218	210	90	105	150
Construction crew	230	375	375	362	203	82	145
Other personnel required for construction	21	27	27	27	21	12	11
Local construction personnel	80	131	131	127	71	29	51
Nonlocal construction personnel	171	271	271	262	153	65	105
Dependents of nonlocal personnel	51	81	81	79	46	20	32
Total immigrant population	222	352	352	341	199	85	137
Housing demand by inmigrants (units):							
Hotels/Motels	74	116	116	113	66	28	45
Rental Units	48	76	76	73	43	18	29
R/V Campers	46	73	73	71	41	18	28
Other	3	5	5	5	3	1	2
Local expenditures by nonlocal construction personnel	$702,810	$4,172,934	$4,043,110	$3,773,186	$942,937	$469,670	$1,081,444
Local expenditures by local construction personnel	$698,880	$4,299,750	$4,165,980	$3,873,979	$931,039	$438,766	$1,108,380
Local expenditures by contractors	$33,000	$664,558	$638,326	$577,116	$71,000	$757,000	$1,476,500

Operation Personnel Total = 47

SOURCES:

All data with the exception of dependents, local expenditures by contractors, and operation personnel were derived from a response to questions on equipment use, construction methods, and employment data dated March 1986 and provided by the Mojave Pipeline Project. The number of dependents was estimated based on .3 dependents per immigrant worker [BLM, 1979]. Operation personnel were derived from Gulf Interstate Engineering [1985]. Local contractors expenditures were also derived from the Gulf Interstate document and reflect miscellaneous materials and local subcontractors provided in the cost summary tables for each pipeline element.

include truck drivers or common laborers. Skilled labor categories include foremen, welders, shooters, blasters, powder men, and measurement men.

In addition to the construction crews other personnel are required for construction such as pipeline company representatives, engineers, and inspectors. These individuals are rarely local hires and are categorized here entirely as nonlocal inmigrant personnel. For the five pipeline spreads, an additional 123 nonlocal persons are added to the 65 percent of the construction crews, and 23 are added for the Sales Meter Station and Compressor/Sales Meter Station nonlocal construction labor to calculate total nonlocal construction personnel. Therefore, the total sum of nonlocal personnel required for the Mojave Pipeline Proposal is 1,298 persons, and the local personnel anticipated to be employed by the project total 620 individuals.

Changes in local area population are estimated to include all nonlocal labor and associated dependents. The number of dependents presented in Table 4.2-10 is based on an estimated .3 dependents per inmigrant laborer which is based on information developed in a survey of pipeline construction workers in 1979. This ratio of dependents per inmigrant laborer was also found to be relevant for the PacTex and Celeron pipelines. The total influx of inmigrant labor related to construction is the sum of the workers and their dependents. This amounts to a total of 1,688 individuals distributed roughly as follows: Mohave County-359 inmigrants; San Bernardino County-528 inmigrants; and Kern County-801 inmigrants. This influx will be temporary in nature, lasting a maximum of 225 days or 7.5 months. The relative magnitude of the influx of inmigrant pipeline workers and their families will be minimal in terms of the general population size of the three affected counties. Population changes by county will in no case exceed one half of one percent. Based on the significance criteria, these impacts are judged to be insignificant.

As shown in Table 4.2-10, 47 permanent operations personnel are anticipated. Based on the preliminary engineering and capital cost estimates [Gulf Interstate Engineering, 1985], these individuals will be spread among a corporate office in Bakersfield (31 persons), a Topock district office (11 persons), and a Boron district office (five persons). These permanent workers and their families will most likely move into the area of the offices. However, the total increase in population associated with these workers will be insignificant.

Expenditures per day in the local economy per nonlocal construction worker are estimated to be $68.50 as reported in the Equipment Use, Construction Methods, and Employment Data for the Mojave Proposal prepared by the applicant. Based on this estimate, the total local expenditures made by nonlocal workers in the local economies will be approximately $15.2 million. The majority of these expenditures will be in retail stores and hotels/motels. Because the increase in expenditures will be temporary and relatively insignificant to total retail sales in these three counties, it is not anticipated that any increases in permanent local employment will occur. If anything, a few additional part-time employees may be added and work hours extended.

In addition to local expenditures by inmigrant labor, two other causes of increased local retail and service sector activity exist. Local residents working on the project will earn wages, part of which will be spent locally. These expenditures were estimated based on local expenditures by local resident project workers at $14.56 for every hour worked. Ten-hour shifts were assumed for the entire project duration based on applicant-supplied data. The total of these expenditures is approximately $15.5 million.

The pipeline construction contractors are also expected to make some local purchases of local materials. These total approximately $3.6 million and are likely to be comprised of items such as tools, fuel, oil, parts and repairs. Because of the insignificance of these amounts relative to total local retail sales and the temporary nature of the purchases, it is not expected that these sales will cause any increase in local employment. The local expenditures by local resident workers on the project may in fact result in a maintenance of local retail and service employment since those individuals most likely move from one project to another and in the absence of this project would either look for work outside the local area or be unemployed.

The spending by local and nonlocal personnel as well as the contractors will result in additional tax revenues to local jurisdictions. However, the major increase in local tax revenues will result from increases in the tax base by the addition of the value of the pipeline and facilities to the assessed value in the local areas. Table 4.2-11 presents the Mojave Pipeline Proposal contribution to local tax bases. The assessed values of the pipeline and facilities are based on the total installed costs. The contribution to the revenues of the two California counties will be insignificant compared to existing total tax bases. However, in Mohave County, Arizona, the tax base is anticipated to increase by 8.31 percent. This is a positive change.

Local housing demands associated with construction are expected to be of a temporary nature due to the short duration of the project (225 day maximum). Estimates of nonlocal housing demands related to construction are Hotel/Motel-43 percent, Rental Units-28 percent, R/V Campsites-27 percent, and Other-2 percent. This distribution was reported by the applicant and was found to be relevant in other recent assessments of the socioeconomic impacts of pipeline projects including the PacTex and Celeron projects. The demands on housing are expected to be supplied by the current number of temporary accommodations in each county.

Table 4.2-11

CONTRIBUTION TO COUNTY TAX BASE, MOJAVE PIPELINE PROPOSAL

State/County	Length of Line (miles) Facilities	Estimated Taxable Value of Pipeline and Facilities (Millions)	Total 1984/1985 County Assessed Value (Millions)	Pipeline Percentage of Total Value	1984/1985 County Tax Revenues (Millions)
ARIZONA					
Mohave	17.75 Compressor/Dual Inlet Meter Station	$ 31.4	$ 377.7	0.31	$ 36.2
CALIFORNIA					
Kern	189.75 20 Meter Stations	112.8	31,451.7	0.36	293.3
San Bernardino	179.00	111.5	30,598.6	0.36	350.8

SOURCE: Value of pipeline and facilities derived based on preliminary engineering and capital cost estimates for Mojave Pipeline Proposal Gulf Interstate Engineering [1985]. Local tax and value information obtained from California State Board of Equalization and Arizona State Department of Revenue.

Table 4.2-12 presents the available temporary and permanent housing in each county and each large city or municipality. The expectation is that the distribution of demand for temporary accommodations by inmigrants will be a function of distance to the construction site and existing supply of accommodations.

In Table 4.2-12, the estimated demand is first assigned to the county in which the construction is occurring. Where there exist cities near the pipeline as well as additional accommodations that are not in selected cities but are near the pipeline, demand is distributed based on the relative number of accommodations. It is unclear how distant the accommodations that are not within cities are to the construction activity. Where two or more cities with supplies of accommodations exist in a county near the pipeline, the estimated temporary housing demand is assigned to particular cities based on a gravity function of distance and housing supply. The distribution is positively related in a linear fashion to housing supply and negatively related in a nonlinear fashion (square-root) to distance to the work site.

In the case of rental units, all demand is assigned to the city within the county. The reason is that it is unclear where the other units available to rent are relative to the pipeline. The worst case assumption is then to allocate the demand to the cities only. These various assumptions were necessary to attempt to allocate demand for housing. It should be pointed out that they may be unrealistic or overly pessimistic in certain cases. While demand may exceed supply, construction workers will modify their behavior by driving farther to work, sleeping in tents, or seeking some other arrangements. This will modify any shortfalls, although the event can occur where all available local supply is completely taken by demand for the pipeline. While this will benefit the proprietors of local motels and RV camps, it can cause congestion in the area and result in the displacement of tourists or other individuals seeking temporary accommodations in the area.

As seen in Table 4.2-12, the demand for temporary accommodations will be met in all the cities in the study region. The greatest demand relative to supply occurs for RV spaces in the Bakersfield area.

Since 71 percent of nonlocal pipeline personnel will be accommodated by hotels, motels and rental units for a period of up to 7.5 months, local areas will benefit significantly from this increase in revenue. These revenues are included as a portion of the local expenditures by nonlocal construction personnel discussed above and presented in Table 4.2-10.

The 47 operation personnel and their families will most likely reside in the Bakersfield and Needles areas and perhaps the small towns in between. Because the number of families possibly relocating to these areas is very small, no shortages in permanent housing supply are expected to result.

Table 4.2-12

HOUSING DEMAND DISTRIBUTION BY AFFECTED AREA, MOJAVE PIPELINE PROPOSAL

State/County /City [1]	Temporary Housing									Permanent Housing
	Hotel/Motel Rooms			Rental Units			RV Spaces			
	Supply	Demand	%	Supply	Demand	%	Supply	Demand	%	
ARIZONA										
Mohave	20 [1]	1	5	811						1,459
Kingman	1,480	36	2	64	11	17	328	9	3	116
Lake Havasu City	1,650	82	5	153	66	43	1,114	65	6	275
CALIFORNIA										
Kern	495 [1]	49	10	4,478			289	106	37	6,591
Bakersfield	2,758	274	10	975	210	22	264	97	37	1,435
San Bernardino	12 [1]	1	8	9,933			253	30	12	19,833
Barstow	1,350	121	9	94	56	60	238	30	13	187
Needles	580	48	8	29	15	51	440	49	11	59
Victorville	688	62	9	133	81	61	303	38	13	266

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[1] Additional rooms and RV spaces in county near the ROW.

SOURCES: Hotel/Motel supply derived from Affected Environment Sections. Rental Units supply is calculated as those units for rent. Year-round supply is calculated as those units for rent or sale. Units listed as vacant awaiting occupancy or demolition, held for occasional use, or boarded up were not included. Due to a lack of data on rental unit or year-round unit available housing supply for individual cities, the relationship between the numbers of these types of units and total housing units in the county in which the city exists was used to adjust total vacant units.

4.2.8.2 Traffic

The construction of the pipeline may affect traffic on transportation corridors in two ways: crossing paved and unpaved roads, railroads and aqueducts, and the movement of equipment, supplies and workers' personal vehicles on roadways.

Existing ~~Forest~~ roads that are used for construction activities will require reconstruction to heavy haul standards. New road construction may not be permitted, depending on terrain and natural resource conditions and values. Use of existing roads will increase traffic which will result in safety concerns and increased maintenance needs. For new road construction, there will be new disturbance to soil, water, and wildlife resources and possible entry into previously unroaded areas.

The construction of crossings of railroads, major roads, and major streams will be performed by crews separate from the construction spread crew. These crews work independently before or after mainline construction near the crossing. As described in Section 2.1.1.2, roads with light traffic (usually unpaved and rural roads) will be crossed using an open-cut conventional ditching method. Detours acceptable to jurisdictional authorities or temporary bridging over the open ditch or a combination of both will be used to provide safe passage of traffic. The duration of these detours is expected to last a few hours to several days. Each major highway, railroad track, and aqueduct identified in Chapter 3 will be bored under from the shoulder without disturbing the surface. A heavy walled pipe or pipe casing will be used as a sleeve for the boring auger. This method is intended to produce no delays or detours.

In most cases, the boring method would be sufficient to cross aqueducts and canals. Aerial suspension would be used where required or necessary. The specific circumstances of each crossing will determine the construction technique. No interruption in water flow is anticipated.

The second impact to traffic, movement of equipment, supplies and workers' personal vehicles, is expected to be temporary. Equipment and supplies will be brought to the work site on the right-of-way on an as-needed basis. Larger construction vehicles, such as trucks or all-terrain vehicles hauling 40 or 80 foot lengths of pipe from rail sidings, may temporarily delay traffic. Except during rush hours near large cities, these delays represent short-term impacts. Workers commuting from motels to the work site on the right-of-way are expected to precede much of the 7 to 9am and 3 to 5pm traffic by virtue of their 10-hour day.

To be significant, these two impacts would need to result in delays or detours of traffic for more than one week in any one crossing. ~~For Forest Service lands, a significant impact could~~

~~result--from--the--construction--of--new--roads--into--previously unroaded-areas.~~

In Kern County, the Mojave mainline will cross State Highway 99 and Interstate Highways 5, 15, and 40. All are heavily traveled routes.

No significant long term impacts to traffic are anticipated.

4.2.8.3 Noise

Pipeline construction would cause a temporary impact to noise quality. The specific noise levels would depend on the equipment involved; the impact would depend on the location of the potential receptors. Typical noise levels for construction would range from 70 to 105 dBA at 50 feet, depending on the equipment. Typical noise levels attributable to a construction spread are about 70 dBA at 250 feet from the pipeline and 50 dBA at 2,500 feet. Any receptor adjacent to the ROW would be affected only while a spread was working in the area. Permanent noise levels in excess of L_{dn} of 55 dBA would be considered to be a significant adverse impact. This level was determined by the EPA to be necessary to protect public health and welfare from outdoor activity interference and annoyance in residential areas.

At selected locations along the proposed ROW, controlled blasting would be required to fracture hard rock formations. This would elevate sound levels temporarily. Blasting would be conducted during daylight hours to reduce possible disturbance.

Projected ambient noise levels along the Mojave Mainline and Transfer Line range from approximately 35 to 65 dBA. This variation is sound levels exists because of the variety of land use areas and population regions that the proposed routes cross. Noise levels below an L_{dn} of 55 dBA as a maximum sound level typically do not adversely affect public health and welfare by interfering with outdoor activities [EPA, 1974].

Since construction activities would be of a temporary nature and ~~no-sensitive-noise-receptors-are~~ only a single noise receptor, Tehachapi Mountain Park, is located along the construction route, construction noise generally will not be considered a significant impact. There are no state regulations governing noise emissions during construction or operation of the proposed project.

Construction of the proposed MJ-1 Compressor Station would take about six months. During this time, noise levels would vary with the type of activity and the actual equipment being used. The noise reaching nearby noise-sensitive receptors would be attenuated by distance, topography, air, and vegetation.

The 22,500 hp of compression installed at the MJ-1 Compressor Station would be the major source of noise emissions during pipeline operation. The applicant has conducted a baseline noise monitoring survey at the MJ-1 Compressor Station based on the existing El Paso Compressor Station at Topock, Arizona. Operational noise levels within the proposed plant boundary would exceed 70 dBA. The nearest receptors, including a marina on the Colorado River and permanent houses, are located more than one mile from the compressor station site. Because of distance attenuation, the nearest sensitive noise receptors would experience an L_{dn} ranging between 41 and 49 dBA, at least 6 dBA below the limit of 55 dBA. Based on these figures the noise levels generated by the MJ-1 Compressor Station would not be perceptible over the existing background noise levels. However, the applicant has not specified the type of natural gas compressor that it plans to use; therefore, it is not possible to determine if the equipment eventually installed would conform to the specification measured at Topock.

4.2.8.4 Recreational Resources

Impacts may occur on both developed facilities (parks, campgrounds, etc.) and dispersed recreational activities. Anticipated short-term impacts on developed facilities may include:

- o disruption of recreational use in terms of increases in noise levels, dust amounts, and inconvenience or delays of access,
- o competition for recreational activities such as fishing and campground space.

Anticipated short-term impacts on dispersed recreational activities may include increased noise resulting from construction work in remote areas where hikers, fishermen, photographers, and observers of the natural habitat seek a quiet setting.

Significant impacts to developed facilities would result if construction, operation, and maintenance removed portions of the land area from future recreational use. Significant impacts to dispersed recreational activities would occur if the pipeline corridor enhanced and encouraged off-road vehicle use where it had not previously occurred or was specifically prohibited,

4.2.8.4.1 Mojave Transfer Line

The Havasu National Wildlife Refuge is intended primarily as a wildlife habitat, but there are two small developed recreational facilities which are within the mile-wide study corridor. The potential impacts of construction of the southern portion of the transfer line include competition for the camping and mobile home spaces by construction workers at Fivemile Landing. Because of the excess of supply over demand in Needles and Lake Havasu City for both motel and RV spaces, competition for space at Fivemile

Landing is likely to be minimal. Catfish Paradise is a day-use facility only, and will probably not be used by construction workers during weekdays.

4.2.8.4.2 Mojave Mainline

The Parker 400 ORV race route is within the construction and operation corridor between MP 80-188. If construction occurs during or near the first two weeks of February, there would be conflict between construction and vehicles involved in the race. If the race had to be postponed, it would represent a short-term impact.

The historic cemetery east of Yermo may experience more use from sightseers if a new road between I-40 and the pipeline were constructed near MP 142.

The Pacific Crest National Scenic Trail may experience temporary disturbance during construction in the form of interruption or delay of traffic as it detours around construction activities, disturbance of vegetation and soils, and disruption of the natural visual scene. The open trench may create a temporary safety hazard.

The recreational facilities within the boundaries of the Tehachapi Mountain Park are somewhat dispersed, but there is a potential for disruption of traffic, increased noise levels during construction, and competition for campground and cabin space. Due to the excess of supply over demand in Bakersfield for motels and RV spaces, competition for campground and cabin spaces would be minimal.

4.2.8.4.3 Kern Lateral

The Kern River County Park is a more developed area with several group activity areas, but ~~since~~ the construction corridor is located at the westernmost portions of the park. The potential for disruption of the recreational activities ~~is limited to~~ involves increased noise, possible delays in traffic ~~near~~, and restricted access to the park.

4.2.9 Land Ownership/Use

Land use impact assessment for the proposed actions, alternatives, and variations will be addressed in two separate ways. Existing land uses can be impacted on a short- or long-term basis. Short-term impacts consist of actions that will only exist from commencement of the construction to no more than one year. Long-term impacts have the potential to affect the existing land use for more than one year and up to as long as the life of the project (approximately 40 years).

The second way of assessing impacts is to examine the policies and regulations of various governmental entities. These policies and regulations will be assessed as a significant impact if the proposed route is not in conformance or compliance with these documents. Existing and planned land uses are controlled by these regulations and policies.

For example, residential areas will be impacted for a short term by construction but there is a potential long-term impact if the route takes residential land out of use for the life of the project. There is a potential for significant impact if the area is zoned for residential use with large-scale utility rights-of-way being excluded. The terms long-term and significant are thus not interchangeable.

Table 4.2-13 shows the number of acres that would be disturbed by each action, alternative, and variation by land ownership category.

Table 4.2-14 shows the number of acres that would be disturbed by each action, alternative, and variation by land use category.

4.2.9.1 Mojave Transfer Line

~~The only e~~Expected impacts for Mojave's transfer line ~~is~~ are the mile of zoned commercial parcels around Golden Shores residential area and Havasu National Wildlife Refuge. Consultation with Mohave County planners for the Golden Shores area will be necessary but no significant impact is anticipated. Location of a pipeline route within the Havasu NWR may not be in conformance with the purpose and management of this NWR by the Service, and thus, would not likely meet the standards for a use permit from the USFWS. The Service considers any proposal to locate pipelines within the NWR to be a significant impact. It should, however, be noted that the FERC staff does not share this opinion given that a pipeline is already in this location.

4.2.9.2 Mojave Mainline

In Mohave County, Arizona, there are no identified land use impacts for the mainline.

In San Bernardino County, California, the proposed mainline is within 0.0 to 0.5 mile of four mining operations. If, when the route is staked, these operations are still adjacent to the route, the impact would be long-term because portions of the mines could be removed from production for the life of the project. The route is not expected to have any impact on the Wilderness Study Areas or the Calico Early Man ACEC. The location of the pipeline where the proposed route is outside the BLM's California Desert Conservation Area designated utility corridor from Siberia to Kramer Junction constitutes a significant impact

Table 4.2-13

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, MOJAVE PIPELINE PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Private Acres	BLM Acres	State Acres	DOD Acres	FS Acres	NWR Acres
Mojave Transfer Line	Mohave, AZ	100' Construction	200.0	7.3	109.1	20.6	-	-	63.0
		50' Operation	100.0	3.6	54.5	10.3	-		31.5
Mainline	Mohave, AZ	100' Construction	12.1	-	-	-	-	-	12.1
		50' Operation	6.1	-	-	-	-	-	6.1
	San Bernardino, CA	100' Construction	2290.1	899.4	1373.3	6.1	-	-	12.1
		50' Operation	1145.5	449.7	686.7	3.0	-	-	6.1
	Kern, CA	100' Construction	1636.4	1338.2	132.1	2.4	163.6	-	-
		50' Operation	818.2	669.1	66.1	1.2	81.8	-	-
Subtotal		100' Construction	3939.4	2237.6	1505.5	8.5	163.6	-	24.2
		50' Operation	1969.7	1118.8	752.7	4.2	81.8	-	12.1
Kern Lateral	Kern, CA	100' Construction	545.5	545.5	-	-	-	-	-
		50' Operation	272.7	272.7	-	-	-	-	-
Alternative A	Mohave, AZ	100' Construction	278.8	42.4	214.5	21.8	-	-	-
		50' Operation	139.4	21.2	107.3	10.9	-	-	-
Alternative B	San Bernardino, CA	100' Construction	909.1	563.6	333.3	-	12.1	-	-
		50' Operation	454.5	281.8	166.6	-	6.1	-	-
	Kern, CA	100' Construction	12.1	12.1	-	-	-	-	-
		50' Operation	6.1	6.1	-	-	-	-	-
Subtotal		100' Construction	921.2	575.8	333.3	-	12.1	-	-
		50' Operation	460.6	287.9	166.7	-	6.1	-	-

BLM = Bureau of Land Management DOD = Department of Defense FS = Forest Service NWR = National Wildlife Refuge

Table 4.2-14

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE, MOJAVE PIPELINE PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Grazing/ Rangeland Acres	Irrigated/ Non-Irrigated Agriculture Acres	Commercial/ Industrial Acres	Residential Acres	Other Acres
Mojave Transfer Line	Mohave, AZ	100' Construction	200.0	-	-	17.0	57.0	126.1
		50' Operation	100.0	-	-	8.5	28.5	63.0
Mainline	Mohave, AZ	100' Construction	12.1	-	-	-	-	12.1
		50' Operation	6.1	-	-	-	-	6.1
	San Bernardino, CA	100' Construction	2290.9	1936.6	303.0	24.2	-	-
		50' Operation	1145.5	981.8	151.5	12.1	-	-
	Kern, CA	100' Construction	1636.4	739.4	606.1	-	121.2	169.7
		50' Operation	818.2	369.7	303.0	-	60.6	84.8
Subtotal		100' Construction	3939.4	2703.0	909.1	24.2	121.2	181.8
		50' Operation	1969.7	1351.5	454.5	12.1	60.6	90.9
Kern Lateral	Kern, CA	100' Construction	545.5	327.3	169.7	-	48.5	-
		50' Operation	272.7	163.6	84.8	-	24.3	-
Alternative A	Mohave, AZ	100' Construction	278.8	-	-	-	48.5	230.3
		50' Operation	139.4	-	-	-	24.3	115.2
Alternative B	San Bernardino, CA	100' Construction	909.1	290.9	593.9	-	24.2	-
		50' Operation	454.5	145.5	297.0	-	12.1	-
	Kern, CA	100' Construction	12.1	12.1	-	-	-	-
		50' Operation	6.0	6.0	-	-	-	-
Subtotal		100' Construction	921.2	303.0	593.9	-	24.2	-
		50' Operation	460.6	151.5	297.0	-	12.1	-

because the BLM's policy of locating within existing corridors is violated. The exact number of homes and their proximity to the pipeline is not available at this time.

In Kern County, California, the pipeline is within a BLM utility corridor but it is not in conformance with Edwards Air Force Base land use plans. The mainline's proposed routing through Stallion Springs residential development would have short and long-term impacts and would be significant because it is routed directly through existing and planned housing development ~~conflicting~~ and conflicts with Stallion Springs' land use plan. The current route would disrupt the entire planning of the rural community. The routing through El Tejon Ranch is ~~expected~~ perceived by the Ranch to have a significant impact because the expressed policy of the ranch is to not allow any more pipelines through their property [Hunt and McCarthy, 1986]. This EIR/EIS does not support such a position. All orchards and vineyards traversed would receive long-term impacts because they would be taken out of production for the life of the project.

4.2.9.3 Kern Lateral

The impacts of the Kern Lateral are long-term with respect to the orchards and vineyards referred to in Section 4.2.9.2. There would be no expected land use impact in the city of Bakersfield because pipelines are considered an acceptable use in residential zoned areas of the city. No homes have been identified within 100 feet of the proposed route.

4.2.10 Cultural Resources

4.2.10.1 Archaeology

Direct and Indirect Impacts. Both direct and indirect impacts will be considered. Direct impacts involve the possibility of direct physical damage or disturbance due to surface or subsurface construction activities. The construction ROW for the pipeline is 100 feet wide, but in view of the lack of precision regarding the exact pipeline route, a 200 foot wide impact zone was utilized for the assessment of direct impacts. This zone is centered on the pipeline centerline.

Indirect impacts may be caused by straying construction equipment, post-construction erosion or site vandalism by workers or the public during and after construction. The indirect impact zone chosen for this analysis lies between 100 and 500 feet from the proposed pipeline centerline.

Impact Significance. All impacts to significant sites, whether direct or indirect, are considered to be potentially significant impacts. As noted in Section 3.1.10.1, all sites are considered to be potentially significant except those officially determined to be ineligible for the National Register or those which have been destroyed. Impacts are designated as "potential" because pipeline routes have not been staked on the ground and formally surveyed to determine which sites will in fact be directly or indirectly impacted. Some sites in the direct impact zone may ultimately not be directly impacted. Many of the sites within the zone of indirect impact may prove to be sufficiently inaccessible and/or unlikely to be affected by erosion such that they would not be indirectly impacted. Such determinations can only be made during an on-the-ground survey.

It should be stressed that the impact figures provided below represent impacts to known sites. In most instances, only a small percentage of the pipeline route has been surveyed. In all cases, the percentage of the direct impact zone that has been surveyed has been provided to place impact figures in the proper perspective.

Presence of Very High or High Sensitivity Pipeline Segments. As described in Section 3.1.10.1, 25 mile segments have been rated in terms of their sensitivity for cultural resources. These ratings indicate the sensitivity of these segments in terms of the potential impact they may have on significant cultural resources. As noted earlier, it is only this pipeline segment sensitivity which can serve as an adequate basis for the comparative analysis of routes and alternatives. In that analysis (see Volume III) the number of very high or high sensitivity segments form the basis for comparison. When such segments are present, this will be indicated.

Indicators for evaluating cultural resource significance are those set forth to determine the eligibility of resources for listing in the National Register of Historic Places (36 CFR 60.4 [48 FR 46306]):

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> - that are associated with events that have made a significant contribution to the broad patterns of our history, or
> - that are associated with the lives of persons significant in our past, or
> - that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or

- o that have yielded, or may be likely to yield, information important to prehistory or history.

Unless a property is of exceptional importance, sites younger than 50 years are not considered eligible for the National Register.

The American Indian Religious Freedom Act (AIRFA) of 1978 requires all federal agencies to take into account the effects of the project on traditional Native American religious and cultural values and practices and, insofar as possible, to not adversely affect those values. Sites of traditional Native American significance include Native American sanctified cemeteries, places of worship, religious or ceremonial sites, and sacred shrines; traditional hunting, fishing, and gathering areas; and archaeological sites that can be attributed to their ancestors and/or contain Native American burials. Sites of Native American significance need not qualify for listing on the National Register of Historic Places to merit protective management.

Indicators for determining the potential effect of construction on significant cultural resources protected under the National Historic Preservation Act are set forth by the Advisory Council on Historic Preservation in 36 CFR 800.3. An effect occurs when an undertaking changes the integrity of location, design, setting, materials, workmanship, feeling, or association of the property, i.e., those attributes that contribute to its significance in accordance with National Register criteria. Criteria for judging an effect to be adverse include:

- o destruction or alteration of all or part of a property,
- o isolation from or alteration of the property's surrounding environment,
- o introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting,
- o neglect of a property resulting in its deterioration or destruction,
- o transfer or sale of a property without adequate conditions or restrictions regarding preservation, maintenance, or use.

Impacts to historic properties are considered significant if there is reasonable probability that a resource eligible for the National Register could be damaged or destroyed as a result of the proposed action or alternatives and if provisions will not be made to mitigate those adverse effects. The completion of adequate mitigation measures (designed with concurrence of the BLM and the State Historic Preservation Officer) would result in a "no adverse effect" (36 CFR 800.4) determination, even if the action involved significant cultural resources. The mitigation measures are part of the cultural resource management program discussed in Section 4.0.

4.2.10.1.1 Mojave Transfer Line

Direct Impacts. There are no direct impacts to known cultural resources. About 22.4 percent of the direct impact zone has been surveyed.

Indirect Impacts. One known site, a lithic scatter with accompanying roasting pit, lies within the zone of indirect impact.

4.2.10.1.2 Mojave Mainline

Direct Impacts. There are 41 known sites situated within the direct impact zone. These include primarily lithic and other artifact scatters and three bedrock mortar sites. Also included are a rock alignment, a hearth, an historic road and railroad grade, two prehistoric trails (including the Trampus Indian Trail) and two historic structures. One prehistoric lithic scatter (KER-322) has been determined to be eligible for the National Register and will be directly impacted. Needles Bridge, which ~~has been nominated to~~ is eligible for the National Register, may also be directly impacted. One of the trails which may be impacted is the National Old Spanish Trails Monument which is a California Historical Landmark (#781); however, it is not known whether the trail has any integrity within the analysis corridor. Finally, the Salt Lake-Santa Fe Trail may also cross the analysis corridor, but it is not known precisely where or whether the trail has any integrity in this area. Only 4.5 percent of the direct impact zone has been surveyed.

Indirect Impacts. Eighteen known sites lie within the indirect impact zone. They include eight artifact scatters, five bedrock mortar sites, two rockshelters, an historic dump and the Topock or Mystic Maze which is listed on the National Register. The latter site is an intaglio that is sacred to local Native Americans. The Red Rock Bridge also falls within this zone but it has been destroyed.

There are three high sensitivity pipeline segments along this route.

4.2.10.1.3 Kern Lateral

Direct Impacts and Indirect Impacts. No known sites will be directly impacted by the proposed pipeline. Only 12.1 percent of the direct impact zone has been surveyed. One campsite lies within the zone of indirect impact.

4.2.10.2 American Indian Concerns

A part of the Fort Mojave Indian Reservation lies within the analysis corridor of the Mojave Transfer Line, but only about 600 feet lies within the direct impact zone (the extreme northeast corner of the Section 34 of T17N, R23E). The Mojave Transfer Line, the Mainline and the Kern Lateral all traverse ethnographic use areas of the various Indian groups living in the southern San Joaquin Valley, the Tehachapis, the Mojave Desert and within the Colorado River Basin. While all impacts to all ancestral (archaeological) sites are considered significant to local American Indian groups, including the Trampus Indian Trail and the National Old Spanish Trails Monument, the Fort Mojave and Chemehuevi groups would be particularly concerned if the Topock or Mystic Maze were to be disturbed.

4.2.11 Paleontological Resources

Paleontological resources in the various proposed pipeline corridors, compressor stations, and microwave stations will be subject to a variety of adverse impacts accompanying construction of the project. These impacts will be in addition to those that have resulted from earlier construction in parallel or nearby rights-of-way. Adverse impacts to fossils, paleontologic localities, and fossiliferous and potentially fossil-bearing rocks are divided into two major categories: direct and indirect.

Direct impacts to paleontological resources are ground-disturbing activities that mainly occur within the 100-foot construction zone, but may also occur outside the construction zone within the one-mile-wide corridor (e.g., access roads). Direct impacts will arise primarily from trenching for the pipeline, grading for staging areas and roads, excavation of rock and dirt for fill, and other surface-breaking activities. Direct disturbances to bedrock usually end with construction; therefore, no ground-disturbing activities are expected to occur during the actual operation of the pipeline. However, the burial of previously exposed rock during construction will be permanent and will prevent future study of these rocks. In addition, exposure of bedrock during construction, or spraying of herbicides to retard plant growth, may subject the rocks to increased weathering and erosion, with the resulting future loss of fossils.

Indirect impacts are those which occur within the one mile-wide corridor but outside the 100-foot construction zone and do not greatly disturb fossil-bearing or potentially fossiliferous rocks. Indirect adverse impacts result in the loss, misuse, or destruction of paleontological resources, and can occur before, during, and after construction. Unauthorized collecting of fossils by project personnel, as well as amateur and commercial collectors, results in increased attrition. Four-wheel drive and other off-road vehicles, when driven over paleontologic localities or fossiliferous rocks during and after project construction, can destroy fossils in the process. Fossils can also be subject to vandalism, especially at rich sites. These indirect impacts are an important consideration because the project corridors are commonly near urban centers and because greater access will be afforded by the building of new access roads, thus increasing visitation to fossiliferous areas.

The relative significance of impacts in a particular area of exposure within a corridor is determined by the paleontologic sensitivities of corridor segments and the presence of paleontologic localities. However, without detailed local and regional studies of each area of the various proposed pipeline corridors, it would be very difficult to make an exact determination of the amount of exposure of a rock unit within a corridor. Each corridor segment has only one paleontologic sensitivity rating (high, moderate, low, or undetermined), which is based on the geologic unit(s) with highest paleontologic importance contained within the segment.

Adverse impacts are divided into three ratings: significant, insignificant, and undetermined significance. These ratings are based on the paleontologic sensitivities of segments of the corridors. The translation from impact rating to paleontologic sensitivities and localities is as follows:

Impact Rating   Paleontologic Sensitivity and Locality

Significant = High sensitivity, and all localities

Insignificant = Moderate and Low sensitivities

Undetermined Significance = Undetermined sensitivities

Thus, corridor segments of high paleontologic sensitivity, and all paleontologic localities (regardless of the sensitivity of the surrounding segment) contain significant paleontologic resources that will be subject to significant direct and indirect adverse impacts. Segments of moderate or low sensitivity have insignificant paleontologic resources that will experience insignificant direct and indirect adverse impacts. Finally, segments of undetermined sensitivity contain paleontologic resources of undetermined significance that will be subject to undetermined direct and indirect adverse impacts.

Table 4.2-15 provides a summary of impacts on paleontological formations.

A detailed breakdown of the geological formation, the fossils present, and the milepost locations of the formations have been discussed in the Paleontological Resources Technical Report [Morales, et al. 1987].

Table 4.2-15

PALEONTOLOGICAL FORMATIONS IMPACT MILEAGES, MOJAVE PIPELINE PROPOSAL

Route Name	Total Route Miles	Impact Mileages Undetermined	 Insignificant	 Significant
Transfer Line	16.5	0.0	16.5	0.0
Prime Route	325.0	94.4	96.7	133.9
Kern Lateral	45.0	0.0	18.8	26.2
Alternative A	23.0	0.0	23.0	0.0
Alternative B	76.0	6.6	16.6	52.8

4.2.12 Visual Resources

The methodology for discussing the significance of visual impacts upon the existing environment with the development of each pipeline alternative included a three-step process:

1. Identify and evaluate candidate sites from those listed in the existing conditions according to Forest Service (FS) and BLM visual impact criteria. FS and BLM visual impact criteria were used to generate visual classes in an overlay technique that combines the maps of Scenic Quality, Sensitivity Levels, and Distance Zones (where available).

2. Utilize existing FS and BLM maps and overlays to quantify the amount of visual class P, R, and PR designated FS land, and Class I, II, and IIIa designated BLM land in the candidate site. Lower designated visual classes were omitted for lack of significant visual sensitivity.

3. Summarize visual impact data and assign impact rating values to quantify a cumulative visual impact rating for each pipeline proposal.

Significant or insignificant visual impacts are determined according to the identified management class and critical viewpoints. All high and moderate visual impacts are significant; all low visual impacts are not significant.

The visual impact criteria used to evaluate the areas identified under the existing conditions relate comparable FS and BLM visual impact criteria and assigned them a high, moderate, or low impact rating, as shown in Table 4.2-16. The visual impact ratings for pipeline segments in areas of existing modifications, such as utility and pipeline corridors and ROWs, were rated at one level of impact below the designated visual sensitivity as shown in

Table 4.2-17. In areas where BLM designated lands were rated at Class III, but with no accompanying scenic quality information (A, B, or C), the impacts were evaluated at the impact rating of a IIIA classification or the worst case scenario.

Table 4.2-16

VISUAL IMPACT CRITERIA, MOJAVE PIPELINE PROPOSAL

FS	BLM	Impact Rating
Lands Without Previous Modifications		
P	Class I	High
R	Class II	High
PR	Class IIIA	Moderate
M	Class IV	Low
REH	Class V	Low
Lands With Previous Modifications (Utility and Pipeline Corridors and ROWs)		
P	Class I	Moderate
R	Class II	Moderate
PR	Class IIIA	Low

The visual impact criteria for each candidate site/area are summarized in the following tables and text by pipeline alternative and milepost designation. In the table the information is organized in the following categories: Jurisdiction (Private Land, FS, or BLM); Affected Resource; VRM/VQO Classification; Critical Viewpoint (roads, towns, campgrounds, or seldom seen); High, Moderate, or Low Visual Impacts (in miles) or No Visual Impact; and Visual Absorption Capacity (high, moderate, low). All pipeline routes, whether additions to existing pipelines or new work, would have limited construction-related visual impacts which include earthwork and grading scars, heavy equipment tracks, support machinery and tool temporary storage, and related waste materials and tailings.

The duration of visual impacts are further defined as short-term or long-term vegetation recovery rates. Short-term recovery rates refer to the time period following actual construction of up to five years where the native vegetation has been re-established and the pipeline scars are concealed. Long-term recovery rates refer to impacts on the landscape which require five or more years to regenerate and blend with the surrounding native environment. Specific factors responsible for scarring and long-term visual impacts can include clear cutting during construction, loss of topsoil during construction, slow vegetation rejuvenation rates, short growing seasons, soil erosion and slippage, steep terrain, and an arid climate.

Table 4.2-17

VISUAL IMPACTS, MOJAVE PIPELINE PROPOSAL

Milepost	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	Visual Impacts (Miles) High [1]	Moderate [1]	Low	None
TRANSFER LINE								
8.0-11.5	FWS	Havasu NWR	III	Colorado River/ Homes	–	–	3.5	
16.0-16.5	FWS	Havasu NWR	III	I-40	–	–	0.5	
MAINLINE								
0.0-1.5	FWS	Colorado River	NA	I-40	–	–	1.5	
1.5-9.0	BLM	Chemehuevi Mts. WSA	IIA	Seldom Seen	–	7.5	–	
9.0-12.2	BLM	Sacramento Mts.	IIBHFg[2]	Seldom Seen	–	3.2	–	
2.2-16.0	BLM		IIIBHBg[3]	Seldom Seen	–	–	–	x
16.0-20.5	BLM		IVCHBg	Seldom Seen	–	–	–	x
20.5-24.5	BLM	Stepladder Mts. WSA	IIA	Seldom Seen	–	4	–	
24.5-38.0	BLM		IVC	Seldom Seen	–	–	–	x
38.0-40.7	BLM		IIIB	Seldom Seen	–	–	–	x
40.7-59.0	BLM		IVC	Seldom Seen	–	–	–	x
59.0-63.0	BLM	Marble Mts.	IIA	I-40	–	4	–	
63.0-73.0	BLM	Bristol Mts. WSA	IIIB	I-40	–	–	–	x
73.0-77.6	BLM	Lava Hills WSA	IIIC	I-40	–	–	–	x
77.6-115.0	BLM		IVC	I-40	–	–	–	x
115.0-128.6	BLM		IIIC	I-40	–	–	–	x
128.6-131.0	BLM		IVC	Seldom Seen	–	–	–	x
142.0-146.0	BLM	Calico Mts.	IIC	I-15, Yermo	–	–	–	x
146.0-161.5	BLM		IVC	Highway 58	–	–	–	x
165.4-186.0	BLM		IVC	Seldom Seen	–	–	–	x
232.0	BLM/PRI	Pacific Crest Trail	NA		–	0.5	–	
241.0-241.5	PRI	Tehachapi Mtn. Park	NA	The Park	–	0.5	–	
				TOTAL (Miles) OF VISUAL IMPACT	0	19.7	5.5	

---

[1] Significant impacts
[2] HFg = high foreground
[3] HBg = high background

4.2.12.1 Mojave Transfer Line

MP 8-11.5, VRM/VQO: Not Applicable
Description: This segment of the proposed route in the Havasu National Wildlife Refuge would create a low visual impact because of existing modifications. Small residential developments and recreational users along the river would have critical views of the proposed route, and the route along the eastern shoreline of the Colorado River floodplain would have a long-term vegetation recovery rate. These impacts are not significant (Figure 4.2-1).

MP 16-16.5, VRM/VQO: Not Applicable
Description: This segment of the proposed route in the Havasu National Wildlife Refuge would create a low visual impact because of existing modifications. Motorists on Interstate 40 (both east and west-bound traffic) would have critical views of the route. The proposed route in the immediately adjacent marsh zone would have a short-term vegetation recovery rate. These impacts are not significant (Figure 4.2-1).

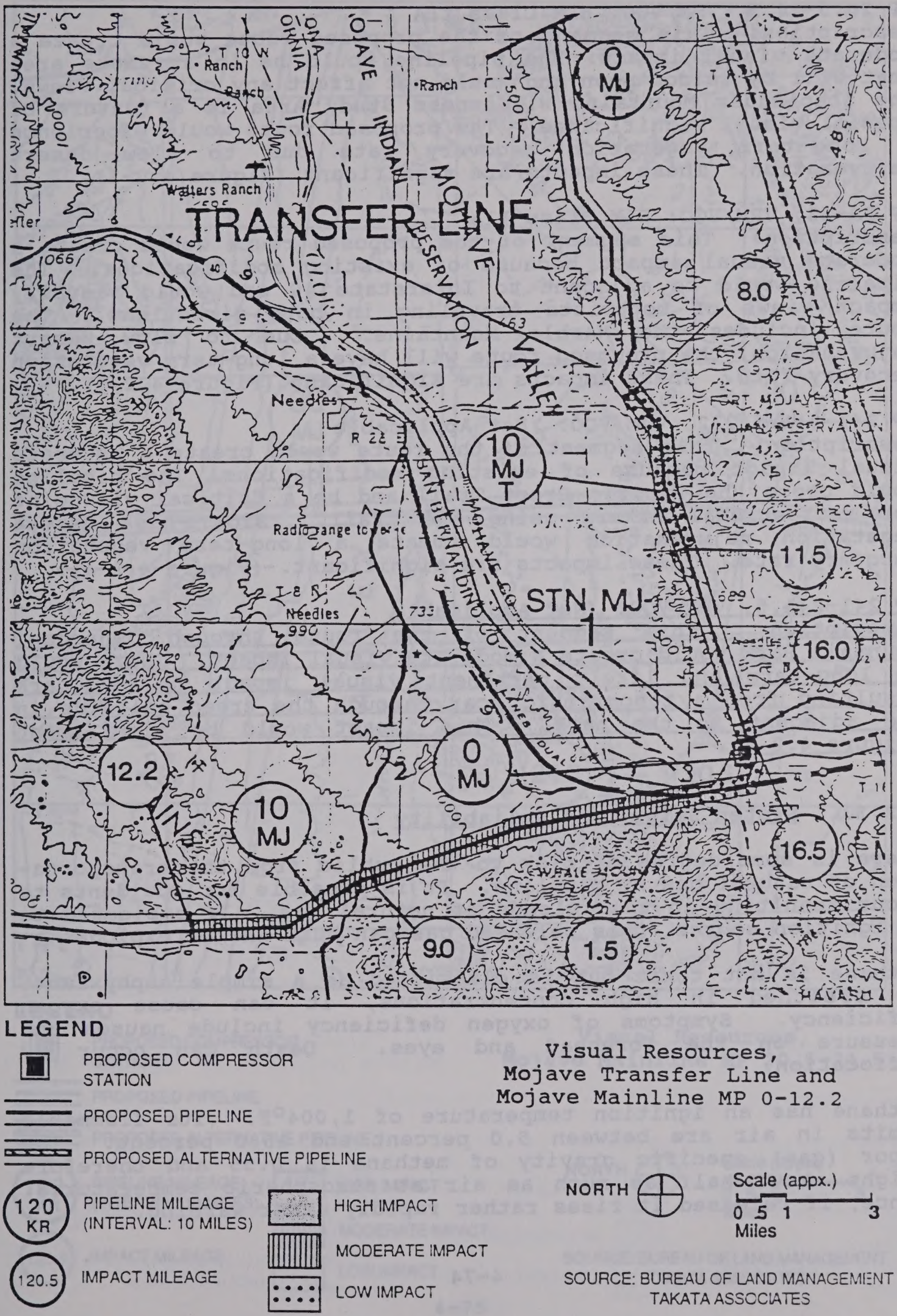
4.2.12.2 Mojave Mainline

MP 0-1.5, VRM/VQO: Not Applicable
Description: This segment of the route at the Colorado River would create a low visual impact. The pipeline would be carried on an existing bridge over the river and new landing structures on both shores would be constructed. Critical views are from Interstate 40 (both east and west-bound traffic). This would create long-term visual impacts; these impacts are not significant (Figure 4.2-1).

MP 1.5-9, VRM/VQO: BLM Class IIA
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. The area includes features of special visual significance such as the Chemehuevi Mountains Wilderness Study Area and Whale Mountains. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. Overall, these impacts are significant (Figure 4.2-1).

MP 9-12.2, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a moderate visual impact. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. The Sacramento Mountains are a feature of special visual significance. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. Overall, these impacts are significant (Figure 4.2-1).

Figure 4.2-1


TRANSFER LINE
0 MJ T
10 MJ T
STN. MJ-1
0 MJ
10 MJ
8.0
11.5
16.0
16.5
12.2
9.0
1.5
Needles
Walters Ranch
Ranch
Radio range tower
FORT MOJAVE INDIAN RESERVATION
MOHAVE VALLEY
SAN BERNARDINO CO
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5 IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources, Mojave Transfer Line and Mojave Mainline MP 0-12.2

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

MP 20.5-24.5, VRM/VQO: BLM Class IIA
Description: This segment of the proposed route would create a moderate visual impact. The pipeline would be in a remote area that will be seldom seen and would not affect any critical views. The Stepladder Mountains Wilderness Study Area is a feature of special visual significance. The proposed route would experience a long-term vegetation recovery rate due to slow desert rejuvenation. These impacts are significant (Figure 4.2-2).

MP 59-63, VRM/VQO: BLM Class IIA
Description: This segment of the proposed route would create a moderate visual impact because of existing modifications. The pipeline would be adjacent to Interstate 40 and would visually impact views of motorists traveling in both directions. The route includes the Marble Mountains. Due to slow desert rejuvenation, the proposed route will have a long-term vegetation recovery rate. These impacts are significant (Figure 4.2-3).

MP ~~241-241.5~~ 232, VRM/VQO: Not Applicable
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would cross the Pacific Crest Trail and be a critical viewpoint for recreational hikers using the trail. Slow, high desert vegetation rejuvenation would create a long-term vegetation recovery rate. These impacts are significant.~~(Figure 4.2-4).~~

MP 241-241.5, VRM/VQO: Not Applicable
Description: This segment of the route through Tehachapi Mountain Park would create a moderate visual impact. There would be long-term and likely permanent visual impact to the park resulting from a topographic scar through the treed hillside in and adjacent to the park. This impact would be significant (Figure 4.2-4).

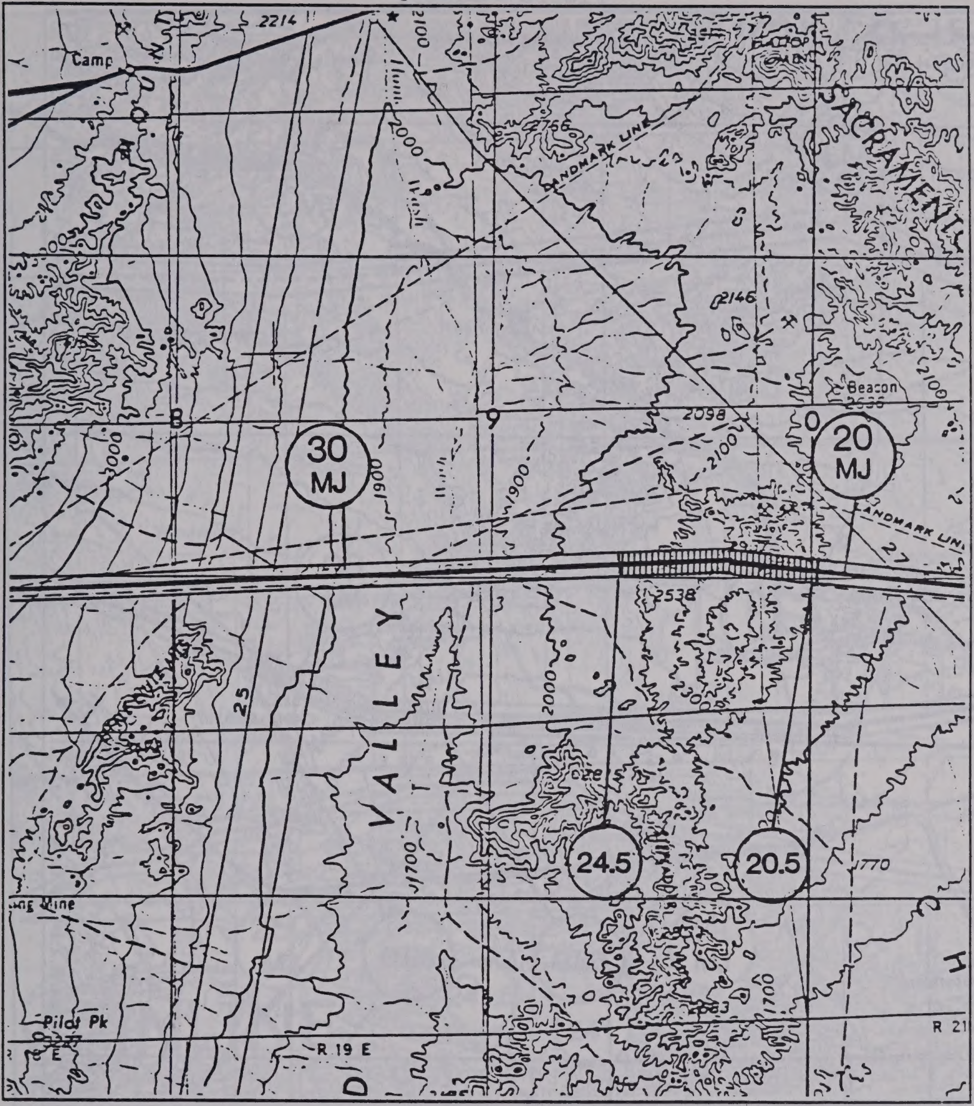
4.2.13 System Safety and Reliability

There is some degree of risk to the public from the transportation of natural gas by pipeline. It is possible for accidents to occur resulting in the release of natural gas. If subjected to an ignition source, this released gas can burn and/or explode.

Methane is not toxic but is classified as a simple asphyxiant. If breathed in high concentrations, it can cause oxygen deficiency. Symptoms of oxygen deficiency include nausea and pressure on the forehead and eyes. Death can occur by suffocation.

Methane has an ignition temperature of 1,004°F. Its flammable limits in air are between 5.0 percent and 15.0 percent. The vapor (gas) specific gravity of methane is 0.55 and therefore weighs about half as much as air at atmospheric temperatures. Hence, if released it rises rather rapidly after warming.

Figure 4.2-2


Camp
2214
2756
LANDMARK LINE
SACRAMENTO
2146
Beacon
2098
2100
30
MJ
20
MJ
LANDMARK LINE
27
1900
9
3000
25
VALLEY
2538
2300
2000
24.5
20.5
1700
1770
Mine
Pilot Pk
R 19 E
R 21
D
H

LEGEND

- ■ PROPOSED COMPRESSOR STATION
- PROPOSED PIPELINE
- PROPOSED ALTERNATIVE PIPELINE
- 120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
- 120.5 IMPACT MILEAGE
- ▒ HIGH IMPACT
- ▥ MODERATE IMPACT
- ⁘ LOW IMPACT

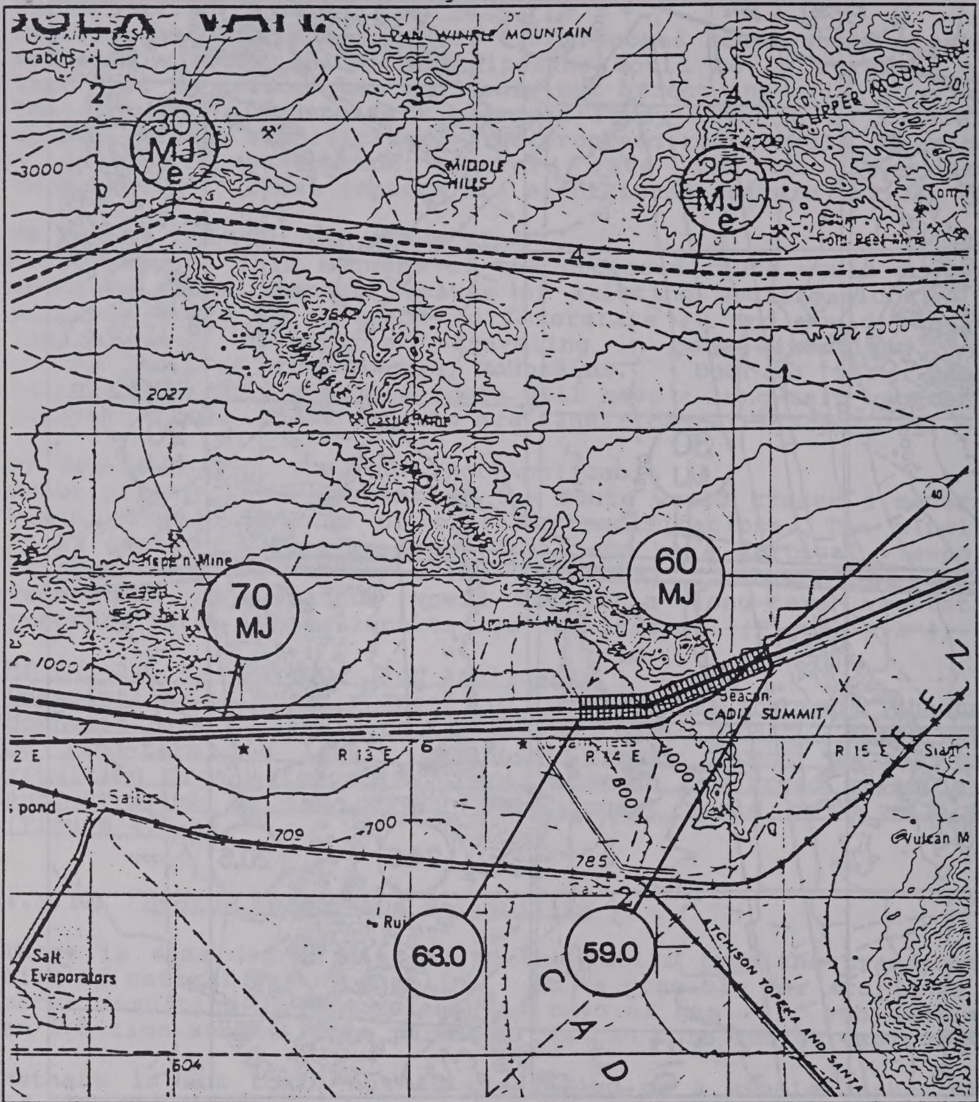
Visual Resources,
Mojave Mainline MP 20.5-24.5

NORTH ⊕

Scale (appx.)
0 .5 1 3
Miles

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.2-3


VAN WINKLE MOUNTAIN
Cabins
2
3
4
30 MJ e
3000
MIDDLE HILLS
COPPER MOUNTAIN
20 MJ e
Gold Reef Mine
2000
1
MARBLE
2027
Castle Point
MOUNTAINS
Hope'n Mine
70 MJ
60 MJ
1000
Beacon
CADIZ SUMMIT
R 13 E
R 14 E
R 15 E
2 E
6
Saltus
pond
709
700
785
800
1000
Vulcan M
Ruin
Salt Evaporators
63.0
59.0
C A D
ATCHISON TOPEKA AND SANTA
604
40

LEGEND

▣ PROPOSED COMPRESSOR STATION

PROPOSED PIPELINE

PROPOSED ALTERNATIVE PIPELINE

120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)

120.5 IMPACT MILEAGE

▩ HIGH IMPACT

▥ MODERATE IMPACT

⁚⁚ LOW IMPACT

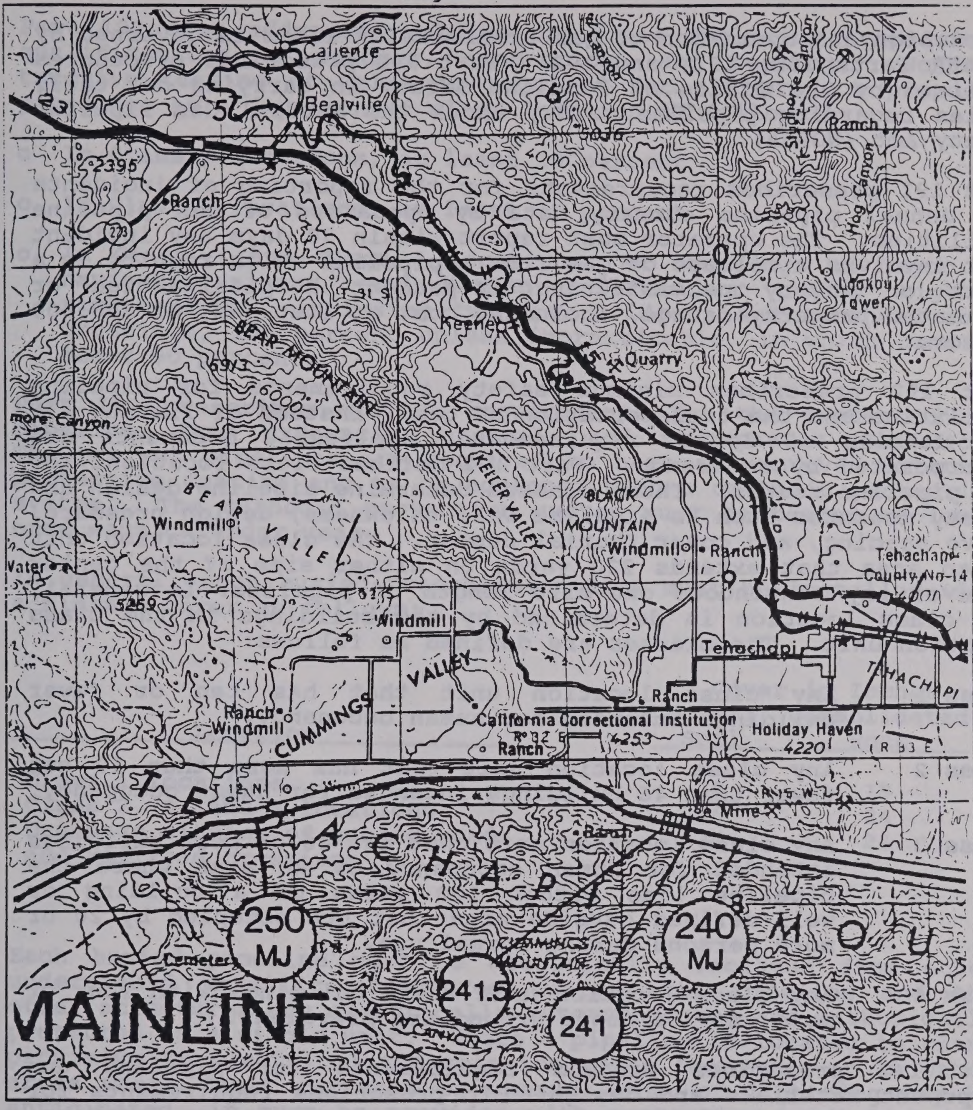
NORTH ⊕

Scale (appx.)
0 .5 1 3
Miles

Visual Resources,
Mojave Mainline MP 59.0-63.0

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.2-4


Caliente
Bealville
58
223
2395
Ranch
Keene
Quarry
Lookout Tower
Hog Canyon
Ranch
5000
4000
BEAR MOUNTAIN
6913
6000
more Canyon
T 31 S
BEAR VALLEY
Windmill
Water
5269
KELLER VALLEY
BLACK MOUNTAIN
Windmill
Ranch
Tehachapi
County No-14
4001
T 32 S
Windmill
Tehachapi
TEHACHAPI
CUMMINGS VALLEY
Ranch
Windmill
Ranch
California Correctional Institution
R 32 E
4253
Ranch
Holiday Haven
4220
R 33 E
T 12 N
R 15 W
Mine
Ranch
TEHACHAPI MOU
250 MJ
240 MJ
241.5
241
7000
CUMMINGS MOUNTAIN
Cemetery
Tejon Canyon
MAINLINE
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5 IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources,
Mojave Mainline MP 241-241.5

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

The design and operation of gas transmission lines is governed by 49 CFR Parts 190, 191, and 192. Part 190 prescribes procedures utilized by the Office of Pipeline Safety in carrying out their duties regarding pipeline safety under the Natural Gas Pipeline Safety Act (NGPSA).

Part 191 prescribes requirements for the reporting of incidents and annual pipeline summary data by operators of gas pipeline facilities. The operator must report within 30 days any incident that involves a release of gas from a pipeline which results in a death or injury necessitating in-patient hospitalization or estimated property damage, including cost of lost gas, of $50,000 or more.

Part 192 prescribes minimum safety requirements for pipeline facilities and the transportation of gas. Instead of listing all the details of design requirements, applicable documents are incorporated by reference. Part 192 defines class locations for the pipeline routes. These classes determine pipeline design and safety measures such as pipeline wall thickness, design pressure, valve spacing, and cover (burial depth). The class location unit is an area that extends 220 yards on either side of the center line of any continuous one-mile length of pipeline. In general, the class location is determined by the buildings in the class location unit. The classes are defined as follows:

Class 1	Any class location unit that has ten or fewer buildings intended for human occupancy.
Class 2	Any class location unit that has more than 10 but fewer than 46 buildings intended for human occupancy.
Class 3	Any class location unit that has 46 or more buildings intended for human occupancy or an area where the pipeline lies within 100 yards of a building or well-defined outside area that are occupied by 20 or more persons during normal use.
Class 4	Any class location unit where buildings with four or more stories above ground are prevalent.

Part 192 prescribes minimum requirements for pipeline and component materials and design. It prescribes requirements for sectionalizing block valves. Depending on the class location, each point on the pipeline must be within a certain distance of a valve. These requirements are as follows:

Class Location	Maximum Distance to Valve
4	2-1/2 miles
3	4 miles
2	7-1/2 miles
1	10 miles

Part 192 also addresses welding practices including procedures, qualifications of welders, inspection, and testing. Nondestructive testing of welds is required for all project proposed pipelines as a function of class location as follows:

- In Class 1 locations, at least 10 percent
- In Class 2 locations, at least 15 percent
- In Class 3 and Class 4 locations, at crossings of major or navigable rivers, and within railroad or public highway rights-of-way, including tunnels, bridges, and overhead road crossings, 100 percent unless impracticable, in which case at least 90 percent.

Part 192 prescribes minimum requirements for the protection of pipelines from external, internal, and atmospheric corrosion. The project pipelines are required to have an approved external protective coating and to be equipped with a cathodic protection system. The cathodic protection system must be tested at least once each calendar year.

In general, each buried transmission line must be installed with a minimum cover as follows:

Location	Cover in Inches Normal Soil	Consolidated Rock
Class 1 locations	30	18
Class 2, 3, and 4 locations	36	24
Drainage ditches of public roads and railroad crossings	36	24

Each buried pipeline must be electrically isolated from other underground metallic structures, unless the pipeline and the other structures are electrically interconnected and cathodically protected as a single unit. Where a pipeline is located in close proximity to electrical transmission tower footings, or in other areas where fault currents or unusual risk of lightning may be anticipated, it must be provided with protection against damage due to fault currents or lightning, and protective measures must also be taken at insulating devices.

Part 192 prescribes minimum leak-test and strength-test requirements for pipelines. For pipelines installed after November 11, 1970, the test pressure is a function of the Class location and the proposed maximum operating pressure (MOP) as follows:

Class Location	Test Pressure
1	1.1 x MOP except 1.25 x MOP if building is within 300 feet of pipeline
2	1.25 x MOP
3 and 4	1.5 x MOP

The test medium must be water in all Class 3 and 4 locations, and may be water, air, or gas depending on specific circumstances in Class 1 and 2 locations.

Part 192 prescribes minimum requirements for the operation of pipeline facilities. Each operator is required to establish a written operating and maintenance plan. This plan, as a minimum, shall include the following:

- Instructions for employees covering operating and maintenance procedures during normal operations and repairs.
- Specific programs relating to facilities presenting the greatest hazard to public safety either in an emergency or because of extraordinary construction or maintenance requirements.
- Provision for periodic inspections to ensure that operating pressures are appropriate for the Class location.

Each operator shall have a patrol program to observe surface conditions on and adjacent to the pipeline right-of-way for indications of leaks, construction activity, and other factors that might affect safety and operation. The maximum allowable frequency between patrols is presented below:

	Maximum Interval Between Patrols	
Class Location	At Highway and Railroad Crossings	At All Other Places
1 and 2	7-1/2 months but at least twice each calendar year	15 months but at least once each calendar year
3	4-1/2 months but at least 4 times each calendar year	7-1/2 months but at least twice each calendar year
4	4-1/2 months but at least 4 times each calendar year	4-1/2 months but at least twice each calendar year

Table 4.2-18 summarizes the causes for failures and casualties reported. Note that more than half the incidents are caused by outside forces. Outside force incidents arise from the encroachment of mechanical equipment such as bulldozers and backhoes, from earth movement such as soil settlement or washouts and other geologic hazards, from weathering effects such as thermal strains, and from willful damage (sabotage).

Table 4.2-18

CAUSES OF REPORTABLE INCIDENTS

Corrosion	15.5%
Damage by Outside Forces	53.9%
Construction or Material Defect	23.5%
Other	7.1%

It is highly unlikely that a large diameter buried pipeline could be completely severed. Heavy excavation equipment may crack or punch a hole in a large diameter pipeline but most likely would not completely sever it. Pipelines, by their nature, are flexible and can withstand considerable ground movement. Hence, unless a pipeline passes over a fault and there is significant ground shifting, landslides, or soil liquefaction, it should not be significantly damaged by an earthquake. Although statistical data have not been found to substantiate this fact, it can safely be assumed that the majority of ruptures do not result in the complete severing of the pipeline.

Table 4.2-19 identifies areas along the Mojave pipeline route which may be particularly sensitive to the construction and operation of the pipeline from a safety aspect and also areas which have the potential to cause pipeline accidents.

Company response time to emergencies could vary widely depending on the location of the problem. In general, response time should not exceed four hours to even the most isolated portions of the route.

4.3 MOJAVE ROUTE ALTERNATIVES

4.3.1 Alternative A

4.3.1.1 Air Quality

Air quality emissions and impacts would be essentially the same as under the proposed primary route which were presented in Section 4.1.1. Total overall construction emissions would be slightly higher than those presented in Section 4.2.1 since this alternative is approximately 6.5 miles longer. Operation phase emissions and impacts would be identical to those in Section 4.2.1.

Table 4.2-19

ROUTE ANALYSIS SUMMARY, MOJAVE PIPELINE PROPOSAL

Location	Potential Vulnerable Resources	Potential Causes of Accidents
Transfer Line		
MP 12-14	Golden Shores Subdivision (residential housing)	
Mainline		
MP 1	House within 50 feet	
MP 136.6		Mojave River flooding
MP 98-180		Various fault crossings
MP 202	Area leased for residential use	
MP 220	Buildings within 50 feet	
MP 234		Garlock fault crossing
MP 240	Housing near Indian John Spring Tehachapi Mountain Park	
MP 245	House within 50 feet	
MP 248-251	Stallion Springs (residential community)	
MP 263	Two houses within 50 feet	
MP 268		White Wolf fault crossing
Kern Lateral		
MP 5		Springs fault crossing
MP 8		White Wolf fault crossing
MP 21-26		Edison fault crossing
MP 29-33	City of Bakersfield residential area Kern River County Park	

4.3.1.2 Geology

No significant geological hazards (except for possible flash flooding when crossing alluvial fans and arroyos) nor impacts to the geological environment would occur along Alternative A.

4.3.1.3 Soil

The probability for significant water erosion is low to moderate along most of this ~~proposed~~ alternative, which would lie within the Mojave Desert region, with a high probability only occurring on short segments with steeper slopes. The probability for significant wind erosion is mostly high, and the dominantly poor reclamation potential indicates potential for significant revegetation problems. The distribution of potential impacts is summarized in Table 4.3-1.

4.3.1.4 Surface Water

No significant impacts would occur along the route of Alternative A.

4.3.1.5 Groundwater

No significant impacts would occur along the route of Alternative A.

4.3.1.6 Freshwater Biology

No significant aquatic resources occur along Alternative A. Several intermittent and ephemeral washes which are tributary to the Colorado River would be crossed by this segment of the proposed pipeline; however, indirect impacts on the Colorado River due to construction at these crossings would not be significant.

Refer to Section 4.2.6 for criteria used to delineate significance of potential impacts to aquatic environments.

4.3.1.7 Terrestrial Biology

4.3.1.7.1 Vegetation

General Vegetation. Of the total 280 acres of vegetation denudation that would occur due to construction of this alternative, approximately 270 acres of Mojavean creosote bush scrub and 10 acres of wetland/riparian vegetation would be denuded. Due to the low revegetation potential of Mojavean creosote bush scrub (Class II) and the sensitive nature of the wetland/riparian

Table 4.3-1

DISTRIBUTION OF POTENTIAL SOIL IMPACTS, MOJAVE PROPOSAL ALTERNATIVES

		Erosion Potential [1]						Reclamation Potential [2] (miles) [3]		
		Water (miles) [3]			Wind (miles) [3]					
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
Alternative A										
0.0-23.0	Mojave Desert	9.0	9.0	5.0	8.0	0.0	15.0	0.0	4.0	19.0
Alternative B										
0.0-76.0	Mojave Desert	71.1	3.8	1.1	1.2	18.3	56.5	1.1	10.3	64.6

---

[1] Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

[2] Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use, productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

[3] Cumulative miles for pipeline segment.

vegetation (Class I), all vegetation removed during construction of this alternative would be considered a significant impact.

Plant Species of Special Concern. One federal candidate species, the barrel cactus, is known to occur in the vicinity of the pipeline in the region. The pipeline would traverse required habitat (270 acres) of this species in the region, thus there is a high potential that it would be significantly impacted.

4.3.1.7.2 Wildlife

Criteria used to determine significant impacts and general impacts associated with construction and operation of Alternative A are the same as those described for the Mojave Mainline (Section 4.2.7.2).

General Wildlife. No significant impacts to general wildlife are expected to occur as a result of construction of this alternative.

Wildlife Species of Special Concern. The bald eagle and peregrine falcon potentially occur along the Colorado River within 0.5 mile of the terminus of this alternative. If they are present in the area, construction activities along the last quarter mile of the alternative would temporarily disturb them. This would be a Class III impact.

The Yuma clapper rail potentially nests within the emergent marsh vegetation within 0.5 mile of the terminus of this alternative. Construction activities are not expected to disturb resident or nesting individuals. No loss of marsh habitat is expected to occur. However, an accidental fuel oil spill, although highly unlikely, would be deleterious to individuals, active nests and habitat. This would be a Class II impact to individuals and to habitat.

The entire proposed alternative (23 miles) crosses potential tortoise habitat. At present, no specific populations or tortoise densities are known for the area of concern. Because the majority of populations identified within Arizona have densities between 25-50 tortoise per square mile [Schwable, 1986], it is assumed that the potential densities within the affected area fall within this range. Construction and revegetation activities at any time of year would result in ~~loss of~~ death of or injured individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost by falling into the open pipeline trench. Utilizing the midpoint figure (37.5 tortoise/mi^2) for the assumed density range discussed above and a 100-foot ROW, 16 tortoise would be potentially lost through construction activities. Although detailed mitigation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the creosote bush scrub community, loss of approximately 270 acres of suitable habitat would be a Class I impact. In addition, increased off-road vehicle access along the completed ROW would increase vandalism to tortoises and long-term habitat deterioration. These are Class II impacts.

4.3.1.7.3 Grazing

No significant impacts to grazing were determined along the route of Mojave Alternative A based on criteria discussed earlier.

4.3.1.8 Socioeconomics

4.3.1.8.1 Population, Housing, and Economic Impacts

Alternative A includes a supplemental pipeline that is 23 miles long and would replace the Mojave Transfer Line. The net increase in construction requirements would be associated with an additional 6.5 miles of pipeline in Mohave County. The likely socioeconomic impacts would not differ markedly, if at all, from those discussed for the proposed project. The exception would be an additional $2.6 million in assessed value in Mohave County ($407,000 x 6.5 miles) [Gulf Interstate Engineering, 1985].

4.3.1.8.2 Traffic

No delays in traffic flows are anticipated since the crossings of two county and local roads and railroad tracks would involve light volumes of traffic.

4.3.1.8.3 Noise

Pipeline construction along Alternative A would cause the same types of impacts as those discussed in Section 4.2.8.3.

4.3.1.8.4 Recreational Resources

No impacts on developed recreational facilities are expected to occur.

4.3.1.9 Land Ownership/Use

Alternative A has no expected land use impacts since none of the significance criteria have been met.

4.3.1.10 Cultural Resources

4.3.1.10.1 Archaeology

Direct and Indirect Impacts. No known sites lie within the direct and indirect impact zones; however, no survey has been conducted along the pipeline site or within the analysis corridor.

4.3.1.10.2 American Indian Concerns

In addition to the general concerns expressed in Section 4.2.10.2, American Indians are concerned about impacts to the known ancestral (archaeological) sites listed above.

4.3.1.11 Paleontological Resources

See Section 4.2.11.

4.3.1.12 Visual Resources

Table 4.3-2 provides a summary of impacts to visual resources.

MP 0-1.8, VRM/VQO: BLM Class III
Description: This segment of the route would create a low visual impact because of the existing modifications. The pipeline would be an area that is seldom seen and no impacts to critical viewpoints are anticipated. Due to slow desert rejuvenation, the route would have a long-term vegetation recovery rate. These impacts are not significant (Figure 4.3-1).

MP 6-10.7, VRM/VQO: BLM Class III
This segment of the route would create a low visual impact because of existing modifications. Critical views by motorists traveling on Interstate 40 (both east and west-bound traffic) would be impacted. Due to slow desert rejuvenation, the route would have a long-term vegetation recovery rate. These impacts are not significant (Figure 4.3-1).

4.3.1.13 System Safety and Reliability

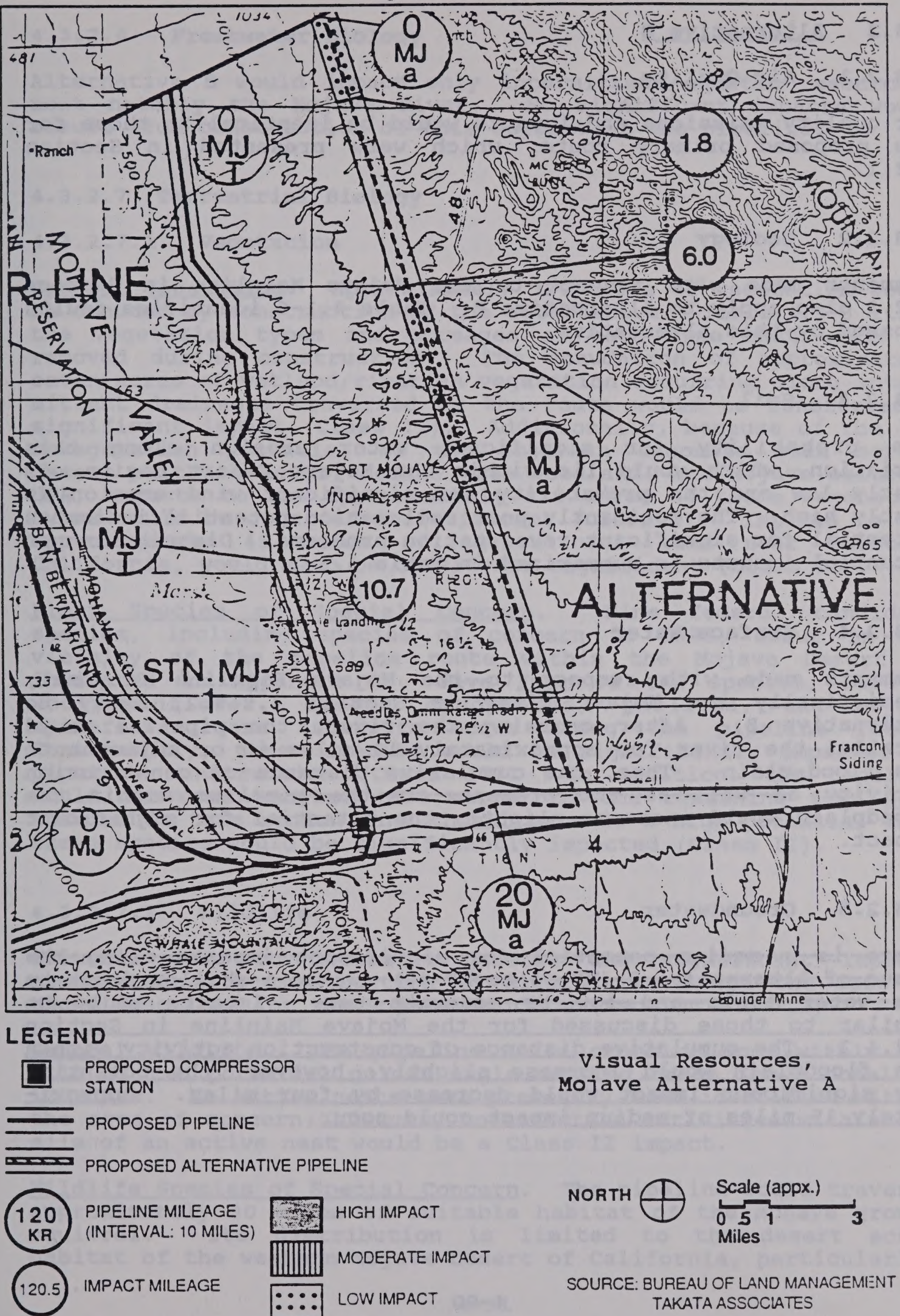
Mojave Pipeline Alternative A changes the route of the Mojave Transfer Line and adds about 6.5 miles of additional 24-inch O.D. pipeline. The system safety and reliability aspects of this alternative would be nearly the same as for the proposed Mojave line. The probability of a release would be insignificantly higher because of the added length. All design and operational considerations would be the same. This route does not pass by any residential areas and there are no known significant geologic or soil conditions that could pose a pipeline safety problem.

Table 4.3-2

VISUAL IMPACTS, MOJAVE PROPOSAL ALTERNATIVES

Milepost	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	Visual Impacts (Miles)			
					High	Moderate	Low	None
ALTERNATIVE A								
0-1.8	BLM	Colorado River	III	Seldom Seen	-	-	1.8	
6-10.7	BLM	Colorado River	III	Seldom Seen	-	-	4.7	
				TOTAL (Miles) OF VISUAL IMPACT	0	0	6.5	
ALTERNATIVE B								
0-6.5	BLM		IIIC	I-40	-	-	-	x
6.5-9.0	BLM	Pisgah Crater	IIB	I-40	-	2.5	-	
9-11	BLM		IIC	I-40	-	-	-	x
59.5-69.3	BLM		IVC	Highway 58	-	-	-	x
				TOTAL (Miles) OF VISUAL IMPACT	0	2.5	0	

Figure 4.3-1


0 MJ a
0 MJ T
1.8
6.0
10 MJ a
10 MJ T
10.7
0 MJ
20 MJ a
R LINE
MOJAVE RESERVATION
VALLEY
ALTERNATIVE
STN. MJ-1
FORT MOJAVE
INDIAN RESERVATION
BLACK MOUNTAINS
Ranch
Franconia Siding
Boulder Mine
POWELL PEAK
WHALE MOUNTAIN
SAN BERNARDINO CO
MOHAVE CO
Needles Range Radio
R 21 W
R 20
R 22½ W
T 16 N
481
3789
2765
733
589
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources, Mojave Alternative A

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

4.3.2 Alternative B

4.3.2.1 Air Quality

Air quality emissions and impacts would be identical to those for the proposed primary route, which were presented in Section 4.2.1.

4.3.2.2 Geology

Comments made with respect to the Mojave Mainline in Section 4.2.2 also apply to Alternative B. Table 3.1-6 identifies faults crossed by this alternative.

4.3.2.3 Soil

The probability for significant water erosion along this variation, which would lie within the Mojave Desert region, is mostly low and the probability for significant wind erosion is mostly high. The dominantly poor reclamation potential indicates potential for significant revegetation problems. Distribution of potential impacts is summarized in Table 4.3-1.

4.3.2.4 Surface Water

Comments made with respect to the Mojave Pipeline Proposal, speci-fically the Mojave River in Section 4.2.4.2, apply to Alternative B. After crossing the river, the pipeline would parallel the river for approximately 10 miles in or adjacent to its flood-plain. Thus, the cumulative distance of construction activity ~~as well as the presence of the pipeline~~ within the floodplain would increase slightly the potential for significant impact.

4.3.2.5 Groundwater

~~There is a medium potential for significant impacts along the route of Alternative B (MP 30 to MP 40) due to a shallow depth to the water table and low to moderate use.~~ Impacts would be similar to those discussed for the Mojave Mainline in Section 4.2.4.2. The cumulative distance of construction activity within the floodplain would increase slightly; however, the potential for significant impact would decrease by four miles. Approximately 15 miles of medium impact could occur.

4.3.2.6 Freshwater Biology

Alternative B would impact only intermittent aquatic resources, most notably the Mojave River. No significant impacts would result from construction of this segment of the pipeline.

4.3.2.7 Terrestrial Biology

4.3.2.7.1 Vegetation

General Vegetation. Approximately 920 acres of vegetation would be denuded by construction of the alternative. Table 4.3-3 lists the vegetation types and acreages of each type that would be removed during construction. The denudation of approximately seven acres of wetland/riparian vegetation occurring along intermittent drainages traversed by the route would be considered a significant impact (Class II). Additionally, because of the low revegetation potential of the Mojavean creosote bush scrub, desert saltbush scrub, Joshua tree woodland, and Mojave saltbush UPA, impacts to the approximately 870 acres of these vegetation types would be considered significant (Class I). Impacts to the approximately 45 acres of agricultural land near Barstow, California, would also be considered significant (Class II).

Plant Species of Special Concern. Nine federal candidate species, including species of concern to CNPS, occur in the vicinity of the pipeline route within the Mojave Desert as indicated in Appendix C. ~~Five~~ Four of the species, Barstow wooly-sunflower, desert cymopterus, pholisma, and Mojave spineflower, are known to occur along the pipeline route. Consequently, these species would be significantly impacted by pipeline construction (Class II). In addition, the pipeline would traverse habitat (870 acres) of the remaining ~~four~~ five species in this region, and thus, there is a high potential that these species would be significantly impacted (Class II).

4.3.2.7.2 Wildlife

Criteria used to determine general and significant impacts associated with construction of Alternative B are the same as those described for the Mojave Mainline (Section 4.2.7.2).

General Wildlife. The pipeline would cross or come within 0.5 mile of two potential golden eagle nesting areas for a total of 12 miles. No active nests have presently been identified within the area of concern; however, construction activities within 0.5 mile of an active nest would be a Class II impact.

Wildlife Species of Special Concern. The pipeline would traverse approximately 30 miles of suitable habitat of the Mohave ground squirrel. Its distribution is limited to the desert scrub habitat of the western Mojave Desert of California, particularly

Table 4.3-3

VEGETATION TYPES AND DENUDED ACREAGES, MOJAVE ALTERNATIVE B

Project Component/ Geographic Region	Vegetation Type	Impact 2/ Class	Denudation 1/ (acres) Short 3/ Term	Long 4/ Term	Per- 5/ manent	Total
Mojave Desert	Mojavean creosote bush scrub	I	0	0	367.2	367.2
	Desert saltbush scrub	I	0	0	128.5	128.5
	Wetland/riparian	II	7.3	0	0	7.3
	Agricultural land	II	44.8	0	0	44.8
	Mojave saltbush 6/	I	0	0	351.5	351.5
	Joshua tree woodland	I	0	0	21.8	21.8
		TOTAL	52.1	0	869.0	921.1
Summary by Impact Class 2/						
	Class	I	0	0	869.0	869.0
	Class	II	52.1	0	0	52.1
	Class	III	0	0	0	0
	Class	IV	0	0	0	0
		TOTAL	52.1	0	869.0	921.1

1/ vegetation loss assuming a 100-foot wide construction ROW and a 50-foot wide operational ROW.

2/ see Section 4.2.7.1 for definitions of impact classes.

3/ short term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short term within the 50-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

4/ long term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (50-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; loss would not be significant.

5/ permanent loss = loss of vegetation within community types with poor or worse revegetation potential; vegetation loss would be significant.

6/ Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage.

the creosote bush scrub and saltbush scrub communities. Construction activities would result in the crushing of individuals by construction equipment on the surface and in their burrows. Loss of individuals could be minimized, but not negated and would be a Class I impact. Other individuals may be displaced during construction, but should recolonize the affected area shortly after disturbance is terminated. This would be a Class III impact. Because of the poor revegetation potential of the desert scrub communities associated with the Mojave ground squirrel, the loss of approximately 363 acres of suitable habitat would be a Class I impact.

In the Mojave Desert of California, the route crosses one mile of high density habitat (100-250 tortoise/mi^2), 19 miles of medium density habitat (50-100 tortoise/mi^2), and 20 miles of low density habitat (20-50 tortoise/mi^2). Construction and revegetation activities at any time of year would result in ~~loss of~~ deaths of or injured individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost by falling into the open pipeline trench. Assuming the midpoint density figures for the three described habitat densities in California (i.e. 175/mi^2, 75/mi^2, 35/mi^2) and a 100 foot ROW, 43 tortoises would potentially be lost due to construction activities. Although detailed mitigation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the vegetation communities associated with the desert tortoise, loss of approximately 920 acres of desert tortoise habitat would be a Class I impact. This loss includes 484 acres of habitat within the designated density habitats described above, and an additional 436 acres of suitable habitat that is not currently identified with high tortoise densities. In addition, increased off-road vehicle access to identified high density tortoise habitats along the ROW would increase vandalism to tortoises and long-term habitat deterioration. These are Class II impacts.

Swainson's hawks are rare, but potential nesters, within the Mojave Desert region. At present, no active nests are known to exist within the area of concern; however, construction activities within a half mile of an active nest during the nesting season would be a Class II impact.

4.3.2.7.3 Grazing

No significant impacts to grazing were identified along the route of Mojave Alternative B based on criteria discussed earlier.

4.3.2.8 Socioeconomics

4.3.2.8.1 Population, Housing, and Economic Impacts

Alternative B is approximately the same length (76 miles) as the corresponding portion of the proposed route which it parallels from MP 115-191 mostly within San Bernardino County, California. This alternative does not differ in terms of socioeconomic impacts since the mileage of pipeline and facilities are very similar. There might be a slight difference in the location of temporary housing demand, but this would not differ significantly from the impacts presented for the proposed project.

4.3.2.8.2 Traffic

No delays in traffic flows are anticipated since Interstate 15 and State road 58, both paved roads, would be crossed by boring under each shoulder to avoid disturbing traffic.

Because of its proximity to State Highway 58 and the existing All American Pipeline, there may be conflict with the proposed widening of the highway and the proposed construction of Alternative B. Construction for approximately 14 miles between MP 64-78 should be coordinated with Caltrans' Project Engineer.

4.3.2.8.3 Noise

Pipeline construction along Alternative B would cause the same noise levels as those discussed in Section 4.2.8.3. This alternative, however, would contain a significant number of noise receptors within 250 feet of the construction ROW and thus noise attributable to construction which could potentially exceed 65 dBA. Any noise receptor adjacent to the ROW would be affected only while a spread was working in the area, less than two weeks. Since construction activities would be of a temporary nature, only during work hours, construction noise for Alternative B would represent a short-term impact.

4.3.2.8.4 Recreational Resources

No impacts on developed recreational facilities are expected since no facilities occur on this route.

4.3.2.9 Land Ownership/Use

The construction of Alternative B has a potential long-term impact in the Daggett, Barstow, and Boron area because they are developed areas with a high potential for more development. The mile of Edwards Air Force Base crossed is considered a significant impact (refer to Section 4.2.9.2). Approximately 30 homes are within 100 feet of the route.~~, a long term impact would occur if they were removed from residential use~~. Impacts to these homes would occur in the form of possible easements through property as well as dust and noise impacts during construction.

4.3.2.10 Cultural Resources

See Section 4.2.10 for direct and indirect impact definitions.

4.3.2.10.1 Archaeology

Direct Impacts. ~~Eight~~ Seven known sites lies within the direct impact zone. These include ~~six~~ five lithic scatters, a quarry site and a burial. Only 15.1 percent of the direct impact zone has been surveyed.

Indirect Impacts. Four sites lie within the indirect impact zone. They include three lithic scatters and a site of unknown type.

There are two high sensitivity pipeline segments along this route.

4.3.2.10.2 American Indian Concerns

There are no specific impacts. See also Section 4.2.10.2.

4.3.2.11 Paleontological Resources

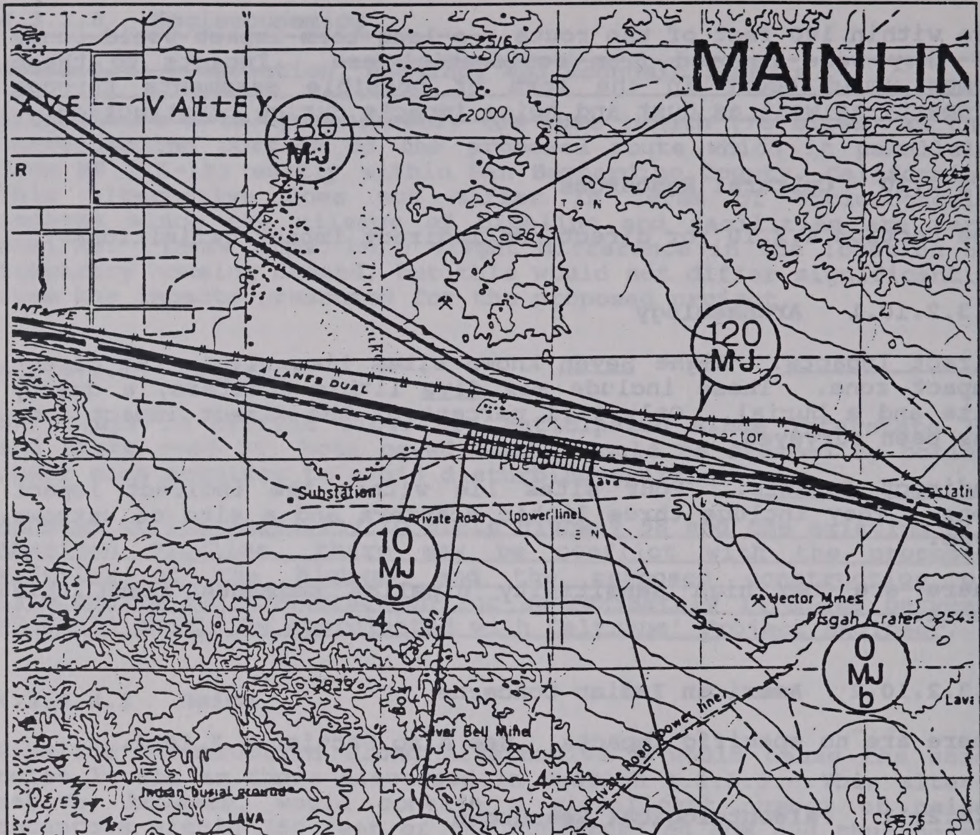
See Section 4.2.11.

4.3.2.12 Visual Resources

Table 4.3-2 provides a summary of visual resources.

MP 6.5-9, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would be adjacent to Interstate 40 and would impact motorists' views in both directions, as well as impact a unique lava formation. The proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.3-2).

Figure 4.3-2


MAINLIN
AVE VALLEY
130 MJ
2516
2000
2643
120 MJ
SANTA FE
4 LANES DUAL
Vector
Substation
Private Road
power line
10 MJ b
Vector Mines
Pisgah Crater 2543
0 MJ b
Lava
3839
Silver Bell Mine
Private Road power line
Indian burial ground
LAVA
9.0
6.5
3938
4000
SUNSHINE PEAK
RIDGE

LEGEND

■ PROPOSED COMPRESSOR STATION

═ PROPOSED PIPELINE

▭ PROPOSED ALTERNATIVE PIPELINE

(120 KR) PIPELINE MILEAGE (INTERVAL: 10 MILES)

(120.5) IMPACT MILEAGE

░ HIGH IMPACT

▥ MODERATE IMPACT

⁙ LOW IMPACT

NORTH ⊕

Scale (appx.)
0 .5 1 3
Miles

Visual Resources,
Mojave Alternative B

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

4.3.2.13 System Safety and Reliability

Alternative B, from a statistical safety perspective, is identical to the proposed Mojave line because the total length of the pipeline remains approximately the same and the identical design and operational considerations will be applied. These routes will traverse various towns and subdivisions such as Newberry Springs, Daggett, Barstow, and Boron that the proposed route avoids.

The following houses and trailers have been identified as being within 200 feet of the pipeline ROW:

MP 13	Three houses within 50-100 ft
MP 20	Four mobile homes within 100 ft
MP 21-22.5	Seven houses within 100-200 ft
MP 30	10-15 houses and mobile homes within 50-100 ft
MP 38-40	Seven houses under construction within 150 ft
MP 43	Seven small trailers within 100 ft
MP 46	45 homes within 100-200 ft
MP 70	150 mobile homes within 150 ft
MP 74	One mobile home within 50-100 ft

4.4 INTEGRATED INTRASTATE SYSTEM ALTERNATIVE

Because the only new facility would be the equivalent of the Mojave Transfer Line, the reader is referred to Section 4.2. (The entire section from the DEIS has been deleted).

4.5 EL DORADO PIPELINE ~~PROPOSAL~~ ALTERNATIVE

4.5.1 Air Quality

This section provides information concerning the emissions and impacts of air pollutants resulting from the construction and operation of the proposed El Dorado pipeline.

4.5.1.1 Project Emissions and Impacts

4.5.1.1.1 Installation/Construction Emissions

The installation/construction phase of the ~~proposed--project~~ alternative would include installation of the mainline, two delivery laterals and one receipt lateral. Emissions associated with these activities would include fugitive dust and construction equipment exhaust emissions. Exhaust emissions would include carbon monoxide (CO), sulfur oxides (SO_2), nitrogen exides (NO_x), hydrocarbons (HC), total suspended particulates (TSP), and fine (inhaleable) particulates (PM10).

Due to a lack of specific information concerning construction equipment types and usage rates, emissions for the El Dorado mainline and laterals were assumed to be emitted at the same amount per mile as the 36-inch diameter Mojave mainline (see Section 4.2.1.1.1).

Total estimated construction emissions for each portion of the pipeline within California are presented in Table 4.5-1. Additional information concerning this extrapolation of emissions is included in the Air Quality/Meteorology Technical Report.

Table 4.5-1

TOTAL ESTIMATED CONSTRUCTION EMISSIONS WITHIN CALIFORNIA, [1/]
EL DORADO PIPELINE PROPOSAL

	Total Project Emissions (tons)					
	THC	NO_x	SO_2	CO	TSP	PM10
Pipeline	50.90	268.75	24.94	145.88	755.50	490.12
Meter Station	0.06	0.30	0.03	1.03	0.64	0.42

[1/] TSP and PM10 fugitive dust emissions include a 50% reduction due to watering.

4.5.1.1.2 Operational Phase Emissions

Operational phase emission increases associated with this pipeline project would be negligible, since no new compressors would be required.

4.5.1.2 Construction/Installation Impacts

The El Dorado Pipeline would parallel the Mojave Pipeline from western Arizona to Kern County, California. The South-East Desert Air Basin, California section would have the same impacts listed in Table 4.2-2, while the El Dorado Mainline and the delivery laterals would have the same impacts presented in Table 4.2-3 and described above.

4.5.2 Geology

A general description of geologic hazards to pipelines, a discussion on the impacts of pipeline construction, operation, and abandonment on the geologic environment, and the definition of significance criteria for determining the significance of the geologic hazards and impacts applicable to the El Dorado Pipeline Proposal are presented in Section 4.2.2 of the Mojave Pipeline Proposal. Table 4.5-2 summarizes the potentially significant geologic hazards ~~and-impacts-that-would-occur~~ along the ~~proposed~~ pipeline facilities.

Table 4.5-2

SIGNIFICANT GEOLOGIC HAZARDS, EL DORADO PIPELINE PROPOSAL AND ALTERNATIVES

Milepost	Location	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence	Flash Flooding
0-16.5	**Transfer Line** Mojave Valley	-	-	-	-	X
0-2	**Mainline** Colorado River Valley	X	-	-	-	-
1-230	Mojave Desert	-	-	-	-	X
100	Ludlow Fault, near Ludlow	-	X	-	-	-
115	Pisgah Fault, near Lava	-	X	-	-	-
130	Calico Fault, Newberry Spring	-	X	-	-	-
145	Harper Fault, east of Barstow	-	X	-	-	-
149	Unnamed fault, between Barstow and Lenwood	-	X	-	-	-
152	Lockhart Fault, near Lenwood	-	X	-	-	-
157	Mojave River Allvium	-	X	-	-	-
172-176	South Lockhart Fault, east of Kramer Junction	-	X	-	-	-
227	Garlock Fault	-	X	-	-	-
231-261	Tehachapi Mtns.	X	X	X	-	X
260	White Wolf Fault, northeast of Mettler	-	X	-	-	-

Table 4.5-2 (continued)

SIGNIFICANT GEOLOGIC HAZARDS, EL DORADO PIPELINE PROPOSAL AND ALTERNATIVES

Milepost	Location	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence	Flash Flooding
262-291	Southern San Joaquin Valley	X	-	-	X	-
292-310	Temblor Range	X	X	-	-	X
311-324.3	Little Santa Maria, McKittrick and San Joaquin Valleys	X	X	-	X	X
0-35.8	East Delivery Lateral Eastern San Joaquin Valley	X	X	-	X	X
1-2	White Wolf Fault, near Arvin	-	X	-	-	-
16-22	Edison Fault, at Bakersfield	-	X	-	-	-
30	Kern Front Fault, north of Bakersfield	-	X	-	-	-
33	Pond Poso Creek Fault, near Poso Creek	-	X	-	-	-
0-75.4	Alternative A Fenner and Cadiz Valleys	-	X	-	-	X
0-8.3	Alternative B Tehachapi Mtns and Bear Valley	-	-	X	-	X
0-5.6	Alternative C Tehachapi Mtns	-	-	X	-	X

4.5.3 Soil

See Section 4.2.3 of the Mojave Pipeline Proposal for a description of criteria used to determine significance as well as a discussion on general impacts that could occur as a result of pipeline construction. Specific impacts or the potential for significant impacts along the various routes of the El Dorado Pipeline Proposal, including the North Receipt Lateral, Mainline, and East Delivery Lateral are presented in Table 4.5-3. In general, impacts that would occur due to the construction of the El Dorado Project are very similar to those described for the Mojave Project in Section 4.2.3.1 and Sections 4.2.3.2.1 through 4.2.3.2.3.

4.5.4 Surface Water

~~Section 4.2.4 of the Mojave Pipeline Proposal presents the criteria used to determine the significance of impacts that could occur to surface water resources due to pipeline construction, operation, and abandonment. In addition, that section includes a discussion on general impacts that could occur to surface water resources as a result of pipeline construction.~~ In general, impacts for the El Dorado alternative are the same as those for the corresponding portion of the Mojave proposal.

4.5.4.1 North Receipt Lateral

No significant water resources would be impacted by the construction, operation, and abandonment of the North Receipt Lateral.

4.5.4.2 El Dorado Mainline

~~Most of the El Dorado Mainline would traverse ephemeral to intermittent streams; however, the proposed route would cross the Colorado River near Topock, Arizona.~~ Since plans for construction entail suspending the pipeline over the Colorado River on ~~a new~~ an existing bridge, no significant impacts to the Colorado would result from construction, operation, and abandonment of the pipeline.

The proposed El Dorado Mainline route would cross the Mojave River approximately eight miles upstream of Barstow, California. The pipeline would be buried below the channel bottom at a depth below estimated scour. ~~If the Mojave River were flowing during construction phase, an increase in sediment load and subsequent decrease in water quality would be expected downstream. This would occur only for a short period of time and would result in~~ no long-term adverse effects. If the river were dry during construction, sediment loading would not be a problem of concern.

Table 4.5-3

DISTRIBUTION OF POTENTIAL SOILS IMPACTS, EL DORADO PIPELINE PROPOSAL

		Erosion Potential 1/						Reclamation Potential 2/		
		Water (miles) 3/			Wind (miles) 3/			(miles) 3/		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
North Receipt Lateral										
0.0-16.5	Mojave Desert	8.2	0.0	8.3	8.2	0.0	8.3	0.0	4.1	12.4
El Dorado Mainline										
0.0-223.0	Mojave Desert	218.5	3.3	1.2	1.1	49.0	172.9	5.8	39.2	178.0
223.0-255.0	Tehachapi Mtns.	8.0	5.8	18.2	1.2	27.3	3.5	3.5	6.7	21.8
255.0-324.3	San Joaquin Valley	62.3	4.8	2.2	13.1	54.1	2.1	63.6	2.8	2.9
East Delivery Lateral										
0.0-35.8	San Joaquin Valley	21.4	9.4	5.0	22.4	10.7	2.7	18.6	10.2	7.0

1/ Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

2/ Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use. Productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

3/ Cumulative miles for pipeline segment.

Water quality in the Mojave River could be affected during construction if an accidental spill of construction chemicals, lubricants, or fuels occurred. A spill of this type could potentially contaminate alluvial wells placed within the floodplain of the river.

4.5.4.3 East Delivery Lateral

The proposed East Delivery Lateral would cross two perennial streams, the Kern River and Poso Creek. Potential impacts would be similar to those described for the Mojave River above. However, since these streams are perennial, construction would probably occur during flowing conditions and, consequently, there is a ~~high~~ potential of significantly increasing sediment loads to the streams. Downstream water users and instream flow uses could be impacted.

4.5.5 Groundwater

The general discussion of impacts that could occur to groundwater resources due to pipeline construction, operation, and abandonment, as well as criteria used to determine the significance of impacts is presented in Section 4.2.5 of the Mojave Pipeline Proposal. Table 4.5-4 summarizes the potential for significant impact along the El Dorado Pipeline Proposal. Approximately 112 miles of the route could be significantly impacted. Seven of these miles would be medium to high impact.

Table 4.5-4

GROUNDWATER IMPACTS, EL DORADO PIPELINE PROPOSAL

Project Component	Milepost	Miles of Potential Impact High	Medium	Low	Comments
North Receipt Lateral		NSI	NSI	NSI	No significant impacts are anticipated
El Dorado Mainline	140-145, 157	-	6	-	Moderate depth to water, low to moderate use
	197	1	-	-	Shallow depth to water, high use
	255-320	-	-	65	Great depth to water, high use
East Delivery Lateral	0-40	-	-	40	Great depth to water, high use

4.5.6 Freshwater Biology

Impacts to freshwater biology as a result of construction and operation of the El Dorado Pipeline would be expected to be the same as for the Mojave Pipeline because the proposed routes are identical or parallel within the same geographic regions. Refer to Section 4.2.6 for a description of possible impacts of the El Dorado Pipeline.

4.5.7 Terrestrial Biology

4.5.7.1 Vegetation

Refer to Section 4.2.7.1 of the Mojave Pipeline Proposal for criteria used to determine the significance of impacts that would occur to vegetation resources due to pipeline construction, operation, and abandonment. In addition, that section includes a discussion on general impacts that could occur to vegetation resources as a result of pipeline construction. Table 4.5-5 lists the cumulative area of each vegetation type that would be denuded due to pipeline construction.

4.5.7.1.1 North Receipt Lateral

General Vegetation. Approximately 200 acres of vegetation would be denuded, including 194 of Mojavean creosote bush scrub (Class I, permanent loss), and six acres of wetland/riparian vegetation (Class II, short-term loss).

Plant Species of Special Concern. One federal candidate species, barrel cactus, occurs in areas that would be traversed by the proposed pipeline. Consequently, there is a high potential that the species could be significantly impacted (Class I) through the destruction of individuals or habitat (194 acres).

4.5.7.1.2 El Dorado Mainline

Mojave Desert (MP 0-223)

General Vegetation. Of the total 2,700 acres of vegetation denudation, approximately 2,680 acres of Class I impact and 20 acres of Class II impact would occur. Included in the Class I impact are three unusual plant assemblages (UPA) as described by BLM [1980].

Plant Species of Special Concern. Of the twelve plant species of special concern that have a potential of being impacted, crucifixion thorn, desert cymopterus, and Barstow wooly sunflower are known to occur within or in close proximity to the proposed pipeline ROW. Consequently, there is a high potential that these species could be significantly impacted by construction of the

Table 4.5-5

VEGETATION TYPES AND DENUDED ACREAGES, EL DORADO PIPELINE PROPOSAL

Project Component/ Geographic Region	Vegetation Type	Impact Class 2/	Denudation 1/ (acres) Short Term 3/	Long Term 4/	Permanent 5/	Total
North Receipt Lateral						
Mojave Desert	Mojavean creosote bush scrub	I	0	0	193.9	193.9
	Wetland/riparian	II	6.0	0	0	6.0
	Subtotal		6.0	0	193.9	199.9
El Dorado Mainline						
Mojave Desert	Mojavean creosote bush scrub	I	0	0	1946.5	1946.5
	Wetland/riparian	II	7.3	0	0	7.3
	Teddybear cholla 6/	I	0	0	35.2	35.2
	Crucifixion thorn 7/	I	0	0	38.8	38.8
	Desert saltbush scrub	I	0	0	133.3	133.3
	Agricultural land	II	12.1	0	0	12.1
	Mojave saltbush 8/	I	0	0	432.7	432.7
	Joshua tree woodland	I	0	0	97.0	97.0
	Subtotal		19.4	0	2683.5	2702.9
Tehachapi Mountains	Mojavean juniper woodland and scrub	I	0	0	60.6	60.6
	Digger pine-oak woodland	II	0	0	278.4	278.4
	Agricultural land	II	24.2	0	0	24.2
	Valley and foothill grassland	III	24.2	0	0	24.2
	Wetland/riparian 9/	II	0.2	0.2	0	0.4
	Subtotal		48.6	0.2	339.0	387.8
San Joaquin Valley	Valley and foothill grassland	III	488.2	0	0	488.2
	Agricultural land	II	363.6	0	0	363.6
	Wetland/riparian	II	0.2	0	0	0.2
	Subtotal		852.0	0	0	852.0
East Delivery Lateral						
San Joaquin Valley	Agricultural land	II	84.8	0	0	84.8
	Urban	III	84.8	0	0	84.8
	Valley and foothill grassland	III	255.7	0	0	255.7
	Wetland/riparian 9/	II	4.2	4.3	0	8.5
	Subtotal		429.5	4.3	0	433.8
	TOTAL		1355.5	4.5	3216.4	4576.4
Summary of Vegetation Type						
	Mojavean creosote bush scrub	I	0	0	2140.4	2140.4
	Teddybear cholla 6/	I	0	0	35.2	35.2
	Crucifixion thorn 7/	I	0	0	38.8	38.8
	Desert saltbush scrub	I	0	0	133.3	133.3
	Agricultural land	II	484.7	0	0	484.7
	Mojave saltbush 8/	I	0	0	432.7	432.7
	Joshua tree woodland	I	0	0	97.0	97.0

Table 4.5-5 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, EL DORADO PIPELINE PROPOSAL

	Vegetation Type	Impact Class [2]	Denudation [1] (acres) Short Term [3]	Long Term [4]	Permanent [5]	Total
Summary of Vegetation Type (continued)	Movjavean juniper woodland and scrub	I	0	0	60.6	60.6
	Digger pine-oak woodland	II	0	0	278.4	278.4
	Valley and foothill grassland	III	768.1	0	0	768.1
	Urban	III	84.8	0	0	84.8
	Wetland/riparian [9]	II	17.9	4.5	0	22.4
	TOTAL		1355.5	4.5	3216.4	4576.4
Summary by Impact Class [2]						
	Class	I	0	0	2938.0	2938.0
	Class	II	502.6	4.5	278.4	785.5
	Class	III	852.9	0	0	852.9
	Class	IV	0	0	0	0
	TOTAL		1355.5	4.5	3216.4	4576.4

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[1] vegetation loss assuming a 100-foot wide construction ROW and a 50-foot wide operational ROW.

[2] see Section 4.2.7.1 for definitions of impact classes.

[3] short term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short term within the 50-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

[4] long term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (50-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; vegetation loss would not be significant.

[5] permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant.

[6] Sacramento/Stepladder Mountains Teddybear Cholla Unusual Plant Assemblage [BLM, 1980].

[7] Crucifixion Thorn Unusual Plant Assemblage [BLM, 1980].

[8] Western Mojave Desert Mojave Saltbush Unusual Plant Assemblage [BLM, 1980].

[9] contains Great Valley mixed riparian forest.

proposed pipeline within this region. In addition, areas containing suitable habitat (2,680 acres) of the twelve species would be traversed and thus denuded.

Field surveys were conducted in July, 1986, for red rock tarweed, a California state listed rare species, in areas containing suitable habitat. No individuals were found along the estimated location of the proposed route. However, any seeps and springs can be assumed to be suitable habitat, and consequently, significant impact (Class II) could occur should this habitat (less than five acres) be affected by pipeline construction.

Tehachapi Mountains (MP 223-255)

General Vegetation. Of the 390 acres of vegetation that would be denuded, 60 acres of Class I impact (Mojavean juniper woodland and scrub) and 300 acres of Class II impact (wetland/riparian, digger pine-oak woodland, and agricultural land) would occur.

Plant Species of Concern. Refer to the Mojave Proposal. Impacts that would occur along this segment of the El Dorado Mainline would be very similar to those presented in that section. Approximately 11 acres of suitable habitat of the species that may occur in the area would be traversed.

San Joaquin Valley (MP 255-324.3)

General Vegetation. Approximately 850 acres of vegetation would be denuded along this segment of the proposed pipeline. Of this total, 360 acres of Class II impact would occur, consisting primarily of loss of agricultural land and a small amount of wetland/riparian vegetation.

Plant Species of Special Concern. The discussion presented in the Mojave Proposal also applies to this route segment. Of the sixteen plant species of concern that have a potential of occurring along the line, only the Comanche Point layia is known to occur within or in close proximity to the proposed pipeline ROW. Consequently, there is a high potential that this species would be significantly impacted by the construction of the proposed pipeline.

Field surveys were conducted in June 1986 for California jewel flower, Bakersfield saltbush and Bakersfield beavertail cactus. No individuals or populations of California jewel flower, Bakersfield saltbush, and Bakersfield beavertail cactus were found along the estimated locations of the North Receipt Lateral route ROW. However, suitable habitat was identified. Loss of this habitat (482 acres) could significantly impact the species (Class II).

4.5.7.1.3 East Delivery Lateral

General Vegetation. Approximately 435 acres of vegetation would be denuded due to pipeline construction along this lateral. Of this total, nine acres of wetland/riparian vegetation (Great Valley mixed riparian forest) would be denuded at the Kern River and Poso Creek representing a Class II impact. In addition, 85 acres of agricultural land would be temporarily denuded (Class II).

Plant Species of Special Concern. The discussion presented in the Mojave Proposal also applies to this lateral. Of the sixteen plant species of concern that may occur along the lateral, Comanche Point layia, Bakersfield beavertail cactus, and Coville's navarretia are known to occur within or in close proximity to the proposed pipeline ROW. Consequently, there is a high potential that these species would be significantly impacted by the construction of the proposed pipeline. Based on field surveys conducted in the area for this EIS, approximately 212 acres of suitable habitat for one or more of the species of concern would be denuded.

Field surveys were conducted for Bakersfield saltbush, Bakersfield beavertail cactus, and California jewel flower along the route of the East Delivery Lateral. Bakersfield beavertail cactus individuals were found at one point along the route. Suitable habitat for the cactus was identified at two locations along the route. Therefore, the species would be significantly impacted by the construction of the proposed project (Class II). Suitable habitat was identified for California jewel flower along the route, although no individuals were identified. There is a high potential that this species would be significantly impacted due to the construction of the pipeline along the proposed route.

4.5.7.1.4 Summary of Impacts

General Vegetation. Of the total 4,576 acres of vegetation that would be denuded due to construction of the El Dorado Proposal, approximately 2,938 acres of Class I impact and 786 acres of Class II impact would occur. The majority of the Class I impacts include the permanent loss of vegetation in the Mojave Desert, and of the Class II impact, the majority includes agricultural land and wetland/riparian vegetation. Refer to Table 4.5-5 for a complete itemization of these losses.

Plant Species of Special Concern. All of the 2,938 acres of Class I impact listed above would include suitable habitat with or without occurrence of plant species of concern listed in Appendix C. The loss of this habitat would essentially be permanent. Approximately 705 acres of suitable habitat contained within the valley and foothill grassland type would be denuded. Thus a total of approximately 3,643 acres of rare plant habitat loss would occur due to construction of the El Dorado Proposal.

Of the plant species of special concern that may be impacted by the El Dorado Proposal, only the following species are known to occur within or in close proximity to the proposed pipeline ROW and therefore would be significantly impacted (Class II). These species include crucifixion thorn, desert cymopterus, Barstow wooly sunflower, Comanche Point layia, Bakersfield beavertail cactus, and Coville's navarretia. However, since field surveys were not conducted for all of the plant species of special concern, many of these species could also occur within the ROW and therefore would also be impacted.

4.5.7.2 Wildlife

Criteria used to determine significant and general impacts associated with the construction and operation of the proposed El Dorado North Receipt Lateral, Mainline and East Delivery Lateral are the same as those described for the Mojave Mainline (Section 4.2.7.2).

4.5.7.2.1 North Receipt Lateral

General Wildlife. Significant and general impacts would be the same as discussed for the Mojave Transfer Line (Section 4.2.7.2.1).

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as discussed for the Mojave Transfer Line (Section 4.2.7.2.1).

4.5.7.2.2 El Dorado Mainline

Mojave Desert Region (MP 0-223)

General Wildlife. Significant and general impacts would be the same as discussed for the Mojave Desert region of the Mojave Mainline.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Mojave Desert region of the Mojave Mainline, except for the extent of impacts to desert bighorn sheep, desert tortoise and Mohave ground squirrel.

The proposed pipeline would cross approximately 24 miles of desert bighorn sheep habitat and three migration corridors. Pipeline construction activities during seasonal migration would be a Class II impact to desert bighorn.

The proposed route crosses 12 miles of high density desert tortoise habitat (100-250 tortoise/mi^2), 34 miles of medium density habitat (50-100 tortoise/mi^2), and 53 miles of low density habitat (20-50 tortoise/mi^2). Using the assumptions made in Mojave Mainline, 123 tortoises would potentially be lost due to construction. Construction activities would result in a loss of approximately 2,683 acres of desert tortoise habitat. This loss includes 1,198 acres of habitat within the designated density habitats described above, and an additional 1,485 acres of suitable habitat that is not currently identified with high tortoise densities. Loss of individuals and habitat would be Class I impacts as defined in Mojave Mainline. Additional impacts to this species are also described in this Section.

The proposed pipeline would traverse approximately 58 miles of suitable habitat of the Mohave ground squirrel. Construction activities would result in the loss of individuals and approximately 702 acres of suitable habitat. Loss of individuals and habitat would be Class I impacts as defined in Mojave Impacts. Additional impacts to this species are also described in this section.

Tehachapi Mountains Region (MP 223-255)

General Wildlife. No significant impacts to general wildlife have been identified within the Tehachapi Mountains. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Tehachapi Mountain region of the Mojave Mainline, except for the extent of impacts to the Tehachapi slender salamander. On this alignment suitable habitat for this species is crossed by the proposed pipeline for only 0.2 mile.

San Joaquin Valley Region (MP 255-324)

General Wildlife. No significant potential impacts to general wildlife have been identified within the San Joaquin Valley region. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the San Joaquin Valley region of the Mojave Mainline, except for the extent of impacts to the blunt-nosed leopard lizard, San Joaquin kit fox, giant kangaroo rat, short-nosed kangaroo rat, Tipton kangaroo rat and Nelson's antelope squirrel.

Construction activities would be a Class II impact to approximately 327 acres of blunt-nosed leopard lizard habitat. The proposed route crosses 27 miles of this habitat, and loss of individuals would be a Class I impact. Additional impacts to this species are described in Mojave Mainline.

Suitable San Joaquin kit fox habitat is crossed by approximately 34 miles of the proposed route. Two active natal dens occur within the area of concern. Loss of individuals and natal dens are Class II impacts. Additional impacts to kit fox are discussed under the Tehachapi Mountain region of the Mojave Mainline.

Eleven miles of suitable giant kangaroo rat habitat is traversed by the proposed route. No active colonies have been identified along this alignment. If individuals are present, construction activities would be a Class II impact. Additional impacts to this species are described in Mojave Mainline.

The proposed route would cross approximately 36 miles of short-nosed kangaroo rat suitable habitat. No active colonies have been identified along this alignment. If individuals are present, construction activities would be a Class I impact. Additional impacts to this species are discussed under the Tehachapi Mountains region of the Mojave Mainline.

Suitable Tipton kangaroo rat habitat is limited to approximately eight miles along this proposed route. Six of these miles have been identified as supporting Tipton kangaroo rats. The other two miles are described as areas of potential occurrence. If individuals are present along the route, construction activities would be a Class I impact. Additional impacts to this species are described under the Mojave Mainline.

The proposed pipeline crosses approximately 30 miles of suitable Nelson's antelope squirrel habitat. Twenty squirrels have been sighted along the proposed route within this habitat during a ground survey in June-July 1986. Loss of individuals would be a Class I impact, and loss of approximately 363 acres of suitable habitat would be a Class II impact.

4.5.7.2.3 East Delivery Lateral

General Wildlife. No significant impacts to general wildlife have been identified along this alignment. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Kern Lateral of the Mojave Mainline (Section 4.2.7.2.3), except for the extent of impacts to the blunt-nosed leopard lizard and San Joaquin kit fox.

Construction activities would be a Class II impact to approximately 61 acres of blunt-nosed leopard lizard habitat. The proposed route crosses five miles of this habitat, and loss of individuals would be a Class I impact. Additional impacts to this species are described in the Mojave Mainline.

Suitable San Joaquin kit fox habitat is crossed by approximately 10 miles of the proposed route. Kit fox are known to occur within the area of concern. Loss of individuals and natal dens are Class II impacts. Additional impacts to kit fox are discussed under the Tehachapi Mountains Region of the Mojave Mainline.

4.5.7.2.4 Summary of Significant Impacts

The following section summarizes significant wildlife impacts that have been previously addressed under the separate geographic regions and alignments. An abbreviated form is presented in Table 4.5-6.

Table 4.5-6

SIGNIFICANT WILDLIFE IMPACTS, EL DORADO PIPELINE PROPOSAL

Wildlife Class	Impact to [1] Individuals	Impact to Habitat
Waterfowl	16 miles (II) [2]	Undeterminable acreage (II)
Raptors	62 miles potential nesting (II)	None
Species of [3] Special Concern	164 miles (I) 17 miles (II)	2,876 acres (I) 414 acres (II) 2 kit fox natal dens (II)

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[1] Impacts to individuals are quantified by cumulative miles of proposed pipeline where impacts would occur.

[2] Indicates impact class: I= Significant adverse impact that could not be mitigated or avoided; II= Significant adverse impact that could be feasibly mitigated or avoided.

[3] Species of Special Concern include all federally listed species, candidates for listing, state listed species and BLM sensitive species. Because of the speculative nature of impacts to California condors, they have been excluded from this category.

General Wildlife. Approximately 16 miles of proposed pipeline runs adjacent to marsh areas along the Colorado River. In the unlikely chance that a fuel oil spill occurred within this area, waterfowl, wading birds and shorebirds would be significantly impacted. Individuals could be debilitated, active nests lost and habitat resources contaminated. Acreage affected would depend on the amount of fuel oil dumped. This would be a Class II impact.

Eight potential golden eagle nesting areas are crossed by approximately 62 miles of the proposed pipeline. Disturbance during nesting would be a Class II impact.

Wildlife Species of Special Concern. The California condor is an extremely rare species that potentially occurs along approximately 145 miles of the proposed route. Because the three remaining condors in the wild are expected to be captured for the captive breeding program [Blum, 1986], it is unlikely that construction activities would impact condors. However, if a condor was killed due to operational procedures, it would be a Class I impact.

The proposed pipeline would cross approximately 181 miles of identified habitat for species of special concern, excluding the California condor. All but about four miles of this identified habitat occurs within the Mojave Desert Region and San Joaquin Valley Region. Construction activities along approximately 164 of these miles would be Class I impacts resulting in the loss of desert tortoise, blunt-nosed leopard lizards, Mohave ground squirrels, Nelson's antelope squirrels, Tipton kangaroo rats and short-nosed kangaroo rats.

Construction activities along an additional 17 miles of the proposed route would disturb Tehachapi slender salamander habitat, giant kangaroo rats, desert bighorn sheep migration corridors, and San Joaquin kit fox. Disturbance or loss of individuals along these 17 miles would be a Class II impact. In addition there would be an unquantifiable loss of Tehachapi pocket mice, San Joaquin pocket mice, and four species of blister beetles. This would be a Class II impact.

Disturbance of approximately 2,876 acres of desert tortoise and Mohave ground squirrel habitat would be a Class I impact due to the poor revegetation potential of the sites.

Disturbance of an approximate cumulative total of 414 acres of Tehachapi slender salamander, blunt-nosed leopard lizard, and Nelson's antelope squirrel habitat would be a Class II impact.

Two active San Joaquin kit fox natal dens, and the potential for others occur within the area of concern. Loss of natal dens would be a Class II impact.

4.5.7.3 Grazing

The criteria for evaluating impacts to grazing were discussed in the Mojave Proposal (see Section 4.2.7.3). In accordance with the first of these criteria, one allotment would be significantly impacted by the construction of the proposed pipeline. This impact would involve 19.1 percent of BLM allotment 26 (Appendix D). This small allotment, encompassing fewer than 1,700 acres, would have 315 acres of permanent cattle grazing area affected.

4.5.8 Socioeconomics

Significance criteria have been presented in Section 4.2.8.

4.5.8.1 Population, Housing, and Economic Impacts

The El Dorado and Mojave proposals are very similar to one another. While deviations from existing rights-of-way and other variations and alternatives can result in significant changes in estimated impacts on physical characteristics of the study region, from a socioeconomic perspective, minor deviations in the route of a pipeline and its length do not result in differences in the estimated impacts. As long as the routes are relatively equidistant from population and economic centers, and the same construction and operation technologies and facility characteristics prevail, the estimated impacts and their relative significance are the same. Therefore, the impacts of the El Dorado proposal are assumed to be the same as those of the Mojave proposal. Readers are referred to Section 4.2.8.1 for a complete discussion of the Mojave proposal.

4.5.8.2 Traffic

Refer to the introductory paragraphs in Section 4.2.8.2, for significance criteria. No delays in traffic flow are anticipated since paved roads with high volume of traffic, such as I-15 and I-40 and several state roads, will be bored under. Many rural and county roads will be crossed, but these have light traffic.

4.5.8.3 Noise

Section 4.2.8.3 details the general construction noise levels which would occur during construction of the El Dorado pipeline. Increased noise levels would be short-term, lasting generally fewer than 10 working days at any particular point along the proposed route. Temporary increases in noise would be of greater impact where construction occurs in or adjacent to residential areas and schools (e.g. MP 140 to 150 and MP 17 to MP 22 of the East Delivery Lateral).

4.5.8.4 Recreational Resources

Refer to the introductory paragraphs in Section 4.2.8.4 for significance criteria.

Since the proposed pipeline corridor does not encompass any developed recreational sites, little or no impact is expected to occur. If the construction takes place during an interval of heavy tourist use of the Colorado River, there would be some delays in traffic within and near the Havasu National Wildlife refuge.

The proposed pipeline corridor will pass through the northern part of the Stoddard Valley Recreational Use Area in San Bernardino County. Planned ORV events such as races would need to be rerouted or postponed. Construction equipment, particularly if left untended on holidays or weekends, might pose a potential hazard to recreational vehicles. After construction, any above-ground markers or signs might be hazardous to vehicles.

The short-term impacts to the Pacific Crest National Scenic Trail have been discussed in Section 4.2.8.4.

4.5.9 Land Ownership/Use

Land use impacts will be assessed according to the degree of conflict between the proposed routing and existing land uses or policies regarding land use, as discussed in Section 4.2.9.

Table 4.5-7 shows the number of acres that would be disturbed by each action, alternative, and variation by land ownership category. Table 4.5-8 shows the number of acres that would be disturbed by each action, alternative, and variation by land use category.

4.5.9.1 North Receipt Lateral

The North Receipt Lateral follows essentially the same route as the Mojave Transfer Line (Section 4.2.9.1). ~~No significance or long-term impacts are anticipated.~~ The U.S. Fish and Wildlife Service believes that significant land use impacts would result to Havasu NWR. These impacts have been previously identified.

4.5.9.2 El Dorado Mainline

There are no long-term or significant land use impacts for El Dorado's Mainline in Mohave County, Arizona.

In San Bernardino County, California, the developed area from Newberry Springs to Boron is expected to expand; therefore the

Table 4.5-7

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, EL DORADO PIPELINE PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Private Acres	BLM Acres	State Acres	DOD Acres	NWR Acres
North Receipt Lateral	Mohave, AZ	100' Construction	200.0	18.2	97.0	24.2	-	60.6
		50' Operation	100.0	9.1	48.5	12.1	-	30.3
Mainline	Mohave, AZ	100' Construction	16.9	2.4	-	-	-	14.5
		50' Operation	8.5	1.2	-	-	-	7.3
	San Bernardino, CA	100' Construction	2230.3	819.4	1339.4	14.5	44.8	12.1
		50' Operation	1115.2	409.7	669.7	7.3	22.4	6.05
	Kern, CA	100' Construction	1684.8	1457.0	29.11	-	198.8	-
		50' Operation	842.4	728.5	14.5	-	99.4	-
Subtotal		100' Construction	3931.0	2278.8	1368.5	14.5	243.6	25.5
		50' Operation	1965.5	1139.4	684.2	7.3	121.8	12.7
East Delivery Lateral	Kern, CA	100' Construction	433.9	433.9	-	-	-	-
		50' Operation	217.0	217.0	-	-	-	-
Alternative A	San Bernardino, CA	100' Construction	913.9	276.4	637.6	-	-	-
		50' Operation	457.0	138.2	318.8	-	-	-
Alternative B	Kern, CA	100' Construction	100.6	100.6	-	-	-	-
		50' Operation	50.3	50.3	-	-	-	-
Alternative C	Kern, CA	100' Construction	67.9	67.9	-	-	-	-
		50' Operation	33.9	33.9	-	-	-	-

BLM = Bureau of Land Management DOD = Department of Defense FS = Forest Service NWR = National Wildlife Refuge

Table 4.5-8

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE,
EL DORADO PIPELINE PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Grazing/ Rangeland Acres	Irrigated/ Non-Irrigated Agriculture Acres	Commercial/ Industrial Acres	Residential Acres	Other Acres
North Receipt Lateral	Mohave, AZ	100' Construction	200.0	-	-	17.0	57.0	126.1
		50' Operation	100.0	-	-	8.5	28.5	63.0
Mainline including West Delivery Lateral	Mohave, AZ	100' Construction	15.8	-	-	-	-	15.8
		50' Operation	7.8	-	-	-	-	7.8
	San Bernardino, CA	100' Construction	2230.3	1733.3	266.7	60.6	121.2	48.5
		50' Operation	1115.2	866.7	133.3	30.3	60.6	24.2
	Kern, CA	100' Construction	1684.8	880.0	606.1	-	-	198.8
		50' Operation	842.4	440.0	303.0	-	-	99.4
Subtotal		100' Construction	3931.0	2613.3	872.7	60.6	121.2	263.0
		50' Operation	1965.5	1306.7	436.4	30.3	60.6	131.5
East Delivery Lateral	Kern, CA	100' Construction	433.9	167.3	218.2	-	48.5	-
		50' Operation	216.9	83.6	109.1	-	24.2	-
Alternative A	San Bernardino, CA	100' Construction	913.9	913.9	-	-	-	-
		50' Operation	456.9	456.9	-	-	-	-
Alternative B	Kern, CA	100' Construction	100.1	46.1	-	-	54.5	-
		50' Operation	50.3	23.0	-	-	27.3	-
Alternative C	Kern, CA	100' Construction	67.9	67.9	-	-	-	-
		50' Operation	33.9	33.9	-	-	-	-

impact to this area could be significant. There is no expected significant or long-term to the Marine Corps firing range because the pipeline would be within a corridor administered by the BLM.

The impacts in Kern County, California, are significant with regard to Edwards Air Force Base where the pipeline would not be in conformance with the base's land use plans, and El Tejon Ranch which has expressed its unwillingness to allow another pipeline to traverse its land. Where orchards and vineyards are crossed, there would be a long-term impact because it would take the land out of production for the life of the project. All cropland would be impacted on a short-term basis.

4.5.9.3 East Delivery Lateral

Refer to the preceding Section for the expected impacts to orchards, vineyards, and cropland.

4.5.10 Cultural Resources

4.5.10.1 Archaeology

See Section 4.2.10 for impact definitions and route sensitivity ratings.

4.5.10.1.1 North Receipt Lateral

Direct and Indirect Impacts. No known sites fall within the zone of direct or indirect impacts. No surveys have been conducted within the direct impact zone.

4.5.10.1.2 El Dorado Mainline

Direct Impacts. A total of 45 known sites lie within the zone of direct impact on the El Dorado Mainline. The vast majority are lithic scatters which sometimes have fire altered rock, groundstone or hearths. They also include two rockshelters, two quarry sites, three bedrock mortar/milling sites, two historic habitation structures with historic trash, three structures related to oil and gas development, and a railroad grade. Two prehistoric trails will be impacted, including the Trampus Indian Trail and the National Old Spanish Trails Monument. The latter is a California Historical Landmark but it is not known whether the trail has integrity in the analysis corridor. An historic trail, the Old Spanish Trail/Mormon-Mojave Road, may also be directly impacted, but it is not known whether it has any integrity within the impact zone. One prehistoric lithic scatter (KER-322) has been determined to be eligible for the National Register. The Needles Bridge ~~has been nominated to~~ is eligible for the National

Register and it may be directly impacted. Only 18.6 percent of the direct impact zone has been surveyed.

Indirect Impacts. A total of 19 known sites fall within the indirect impact zone. These include eight lithic or lithic-groundstone scatters (sometimes with hearths), a habitation site, a rockshelter, an oil well site, and two oil and gas development sites with historic trash. The Red Rock Bridge is listed in the Arizona SHPO files, but it has been destroyed. The Topock or Mystic Maze is listed on the National Register. This intaglio site is considered sacred to local Native Americans.

There are three high sensitivity pipeline segments along this route.

4.5.10.1.3 East Delivery Lateral

Direct and Indirect Impacts. There are no known cultural resource sites situated within these impact zones. Only 1.8 percent of the direct impact zone has been surveyed.

There is one high sensitivity pipeline segment along this route.

4.5.10.2 American Indian Concerns

Since the El Dorado Pipeline Proposal follows the Mojave route relatively closely, please refer to Section 4.2.10.2. Note that the Mojave Transfer Line is similar to El Dorado's Northern Receipt Lateral and the Mojave Kern Lateral is similar to El Dorado's Eastern Delivery Lateral. A very small portion of the Fort Mojave Indian Reservation lies within the zone of direct impact (extreme northeast corner of Section 34, T17N, R23E) along the Mojave Transfer Line.

4.5.11 Paleontological Resources

Thirty-six fossil localities occur within the corridor of the El Dorado Mainline (Table 3.4-11) and will be subject to High direct and indirect impacts. Table 4.5-9 lists the impact mileages broken down by impact rating and by corridor segments.

Detailed information on the fossils present and formation names and locations are in the Paleontologic Resources Technical Report [Morales et al. 1987].

Table 4.5-9

PALEONTOLOGICAL FORMATION IMPACT MILEAGES,
EL DORADO PIPELINE PROPOSAL

Route Name	Total Route Miles	Impact Mileages Undetermined	Insignificant	Significant
North Receipt	16.5	0.0	16.5	0.0
Mainline	324.3	93.4	111.7	119.2
East Delivery	35.8	0.0	17.2	18.6
Alternative A	75.4	73.3	1.5	0.6
Alternative B	8.3	0.0	8.3	0.0
Alternative C	5.6	0.0	5.6	0.0

4.5.12 Visual Resources

Refer to Section 4.2.12 for the impact methodology. Table 4.5-10 is a summary of the impacts of visual resources on the mainline and all alternatives.

4.5.12.1 North Receipt Lateral

MP 0-10.7, VRM/VQO: Not Applicable
Description: This segment of the pipeline route in the Havasu National Wildlife Refuge would create a low visual impact because of existing modifications. Small residential developments and recreational users along the river would have critical views of the proposed route, and the route along the eastern shoreline of the Colorado River floodplain would have a long-term vegetation recovery rate. These impacts are insignificant (Figure 4.5-1).

4.5.12.2 El Dorado Mainline

MP 1.5-7.3, VRM/VQO: BLM Class IIA
Description: This segment of the pipeline route would create a moderate visual impact because of existing modifications. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. The area includes features of special visual significance such as the Chemehuevi Mountains Wilderness Study Area and Whale Mountains. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-1).

Table 4.5-10

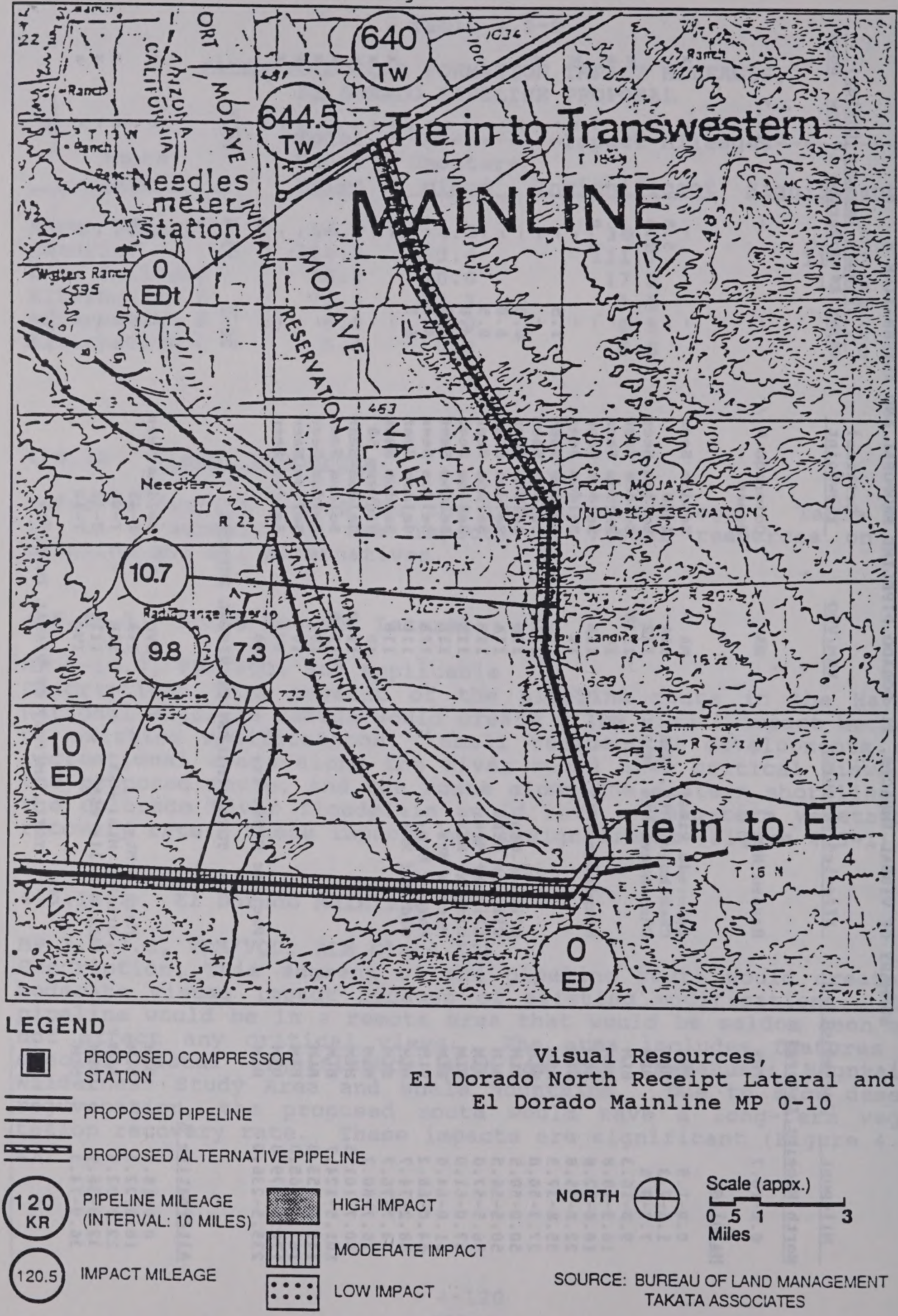
SUMMARY OF VISUAL IMPACTS, EL DORADO PIPELINE PROPOSAL AND ALTERNATIVE A

Milepost	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	Visual Impacts (Miles)			
					High [1]	Moderate [1]	Low	None
North Receipt Lateral								
0.0-10.7	FWS	Havasu NWR	NA	Colorado R./ Homes	-	-	10.7	
Mainline								
0.0-1.5	FWS	Colorado River	NA	Seldom Seen	-	-	-	x
1.5-7.3	BLM	Chemehuevi Mts. WSA	IIA	I-40	-	5.8	-	
7.3-9.8	BLM	Chemehuevi Mts. WSA	IIB	Seldom Seen	-	2.5	-	
9.8-16.3	BLM		IIIB	Seldom Seen	-	-	-	x
16.3-18.8	BLM		IV	Seldom Seen	-	-	-	x
18.8-22.8	BLM	Stepladder Mts.	IIA	Seldom Seen	-	4.0	-	
22.8-35.8	BLM		IV	Seldom Seen	-	-	-	x
35.8-37.3	BLM		IIB	Seldom Seen	1.5	-	-	
27.3-50.0	BLM		IIIC	Seldom Seen	-	-	-	x
50.0-50.5	BLM	Clipper Mts.	IIB	Seldom Seen	0.5	-	-	
50.5-56.5	BLM	Clipper Mts.	IIA	Seldom Seen	6.0	-	-	
56.5-57.0	BLM	Clipper Mts.	IIB	Seldom Seen	0.5	-	-	
57.0-61.0	BLM	Clipper Mts.	IIB	Seldom Seen	4.0	-	-	
61.0-64.0	BLM	Marble Mts.	IIB	Seldom Seen	3.0	-	-	
64.0-68.2	BLM	Marble Mts.	IIA	Seldom Seen	4.2	-	-	
68.2-74.7	BLM	Old Dad Mts.	IIB	Seldom Seen	6.5	-	-	
74.7-76.7	BLM		IIB	Seldom Seen	-	-	-	x
76.7-80.7	BLM		IV	Highway 58	-	-	-	x
80.7-101.5	BLM		IIIC	Seldom Seen	-	-	-	x
101.5-124.7	BLM		IIIB	Seldom Seen	-	-	-	x
149.8-153.0	BLM		IV	Seldom Seen	-	-	-	x
162.5-165.0	BLM		IV	Seldom Seen	-	-	-	x
170.0-179.8	BLM		IV	Seldom Seen	-	-	-	x
235.5-236.0	BLM	Pacific Crest Tr.	NA		-	0.5	-	
		TOTAL (MILES) OF VISUAL IMPACTS			26.2	12.8	10.7	
Alternative A								
0.0-18.3	BLM		IVC	Seldom Seen	-	-	-	x
18.3-22.3	BLM	Marble Mts.	IIA	I-40	-	4.0	-	
22.3-32.3	BLM	Bristol Mts. WSA	IIB	I-40	-	-	-	x
32.3-36.9	BLM	Lava Hills WSA	IIIC	I-40	-	-	-	x
36.9-74.3	BLM		IVC	I-40	-	-	-	x
		TOTAL (Miles) OF VISUAL IMPACTS			0	4.0	0	

---

[1] Significant impacts

Figure 4.5-1


640 Tw
644.5 Tw
Tie in to Transwestern
MAINLINE
Needles meter station
0 EDt
MOHAVE RESERVATION
VALLEY
ARIZONA
CALIFORNIA
FORT MOJAVE INDIAN RESERVATION
Needles
Topock
10.7
9.8
7.3
10 ED
Tie in to EL
0 ED
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5 IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources,
El Dorado North Receipt Lateral and
El Dorado Mainline MP 0-10

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

MP 7.3-9.8, VRM/VQO: BLM Class IIB
Description: This segment of the pipeline route would create a moderate visual impact because of existing modifications. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. The area includes features of visual interest such as the Chemehuevi Mountains Wilderness Study Area and Whale Mountains. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-1).

MP 18.8-22.8, VRM/VQO: BLM Class IIA
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would be in a remote area that would be seldom seen and not affect any critical views; however, the area includes the Stepladder Mountains Wilderness Study Area. Due to slow desert rejuvenation, the proposed route will have a long-term vegetation recovery rate. These impacts are determined to be significant (Figure 4.5-2).

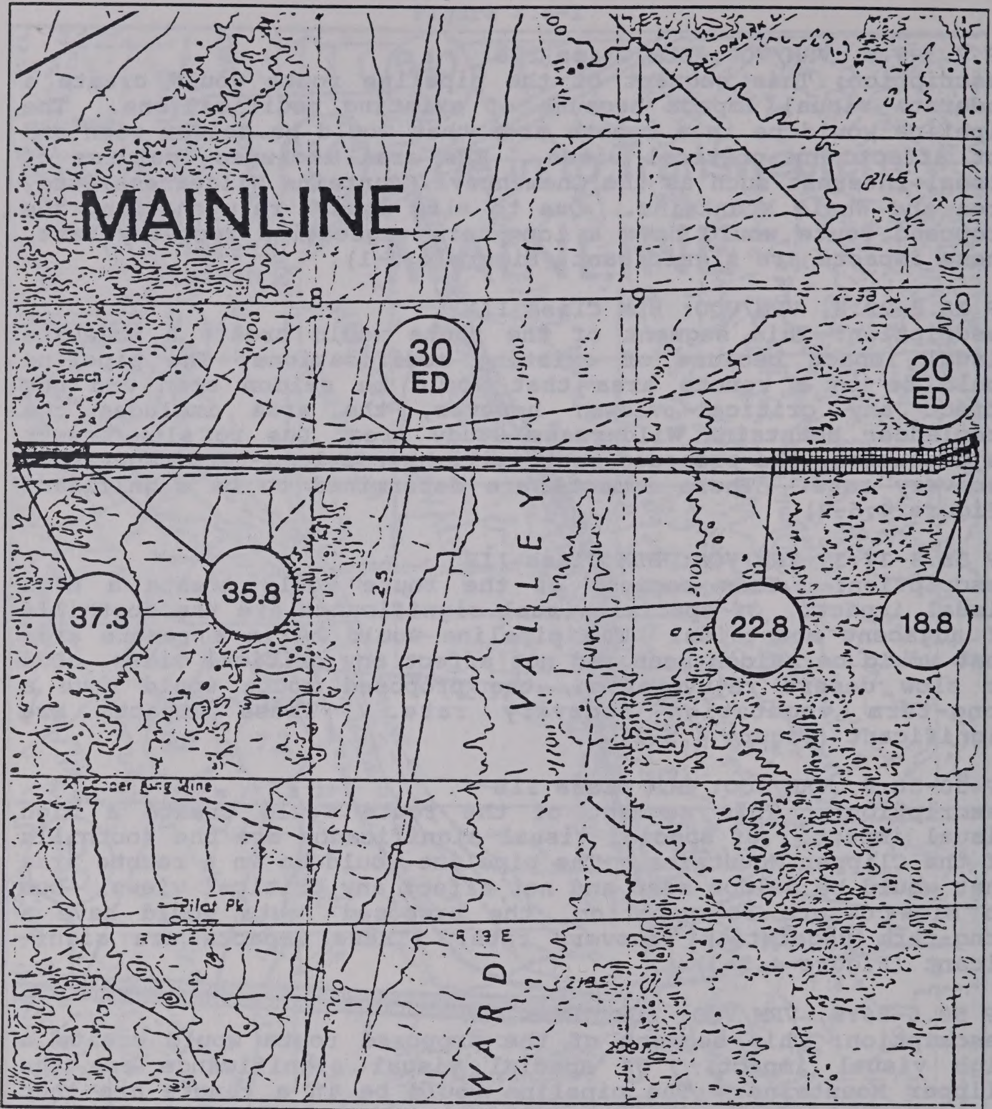
MP 35.8-37.3, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of special visual significance are the foothills of adjacent mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-2).

MP 50-50.5, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of special visual significance are the foothills of the Clipper Mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-3).

MP 50.5-56.5, VRM/VQO: BLM Class IIA
Description: This segment of the proposed route would create a high visual impact. Of special visual significance are the Clipper Mountains. The pipeline would be in a remote are that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-3).

MP 56.5-57, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of visual interest are the foothills of the Clipper Mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-

Figure 4.5-2

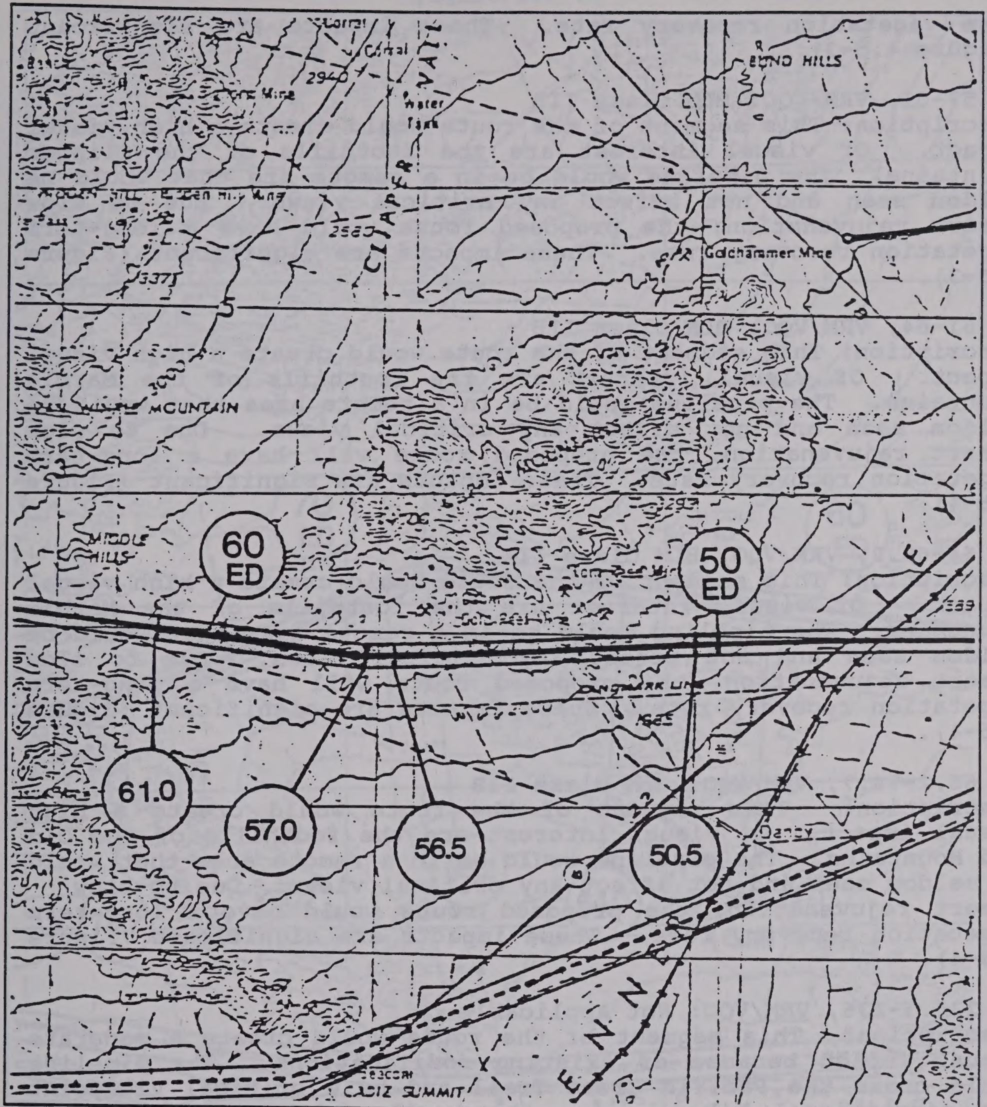

MAINLINE
30 ED
20 ED
37.3
35.8
22.8
18.8
WARD VALLEY
Pilot Pk
R 19 E
2145
2007
2156
2116

LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources,
El Dorado Mainline
MP 18.8-22.8 and MP 35.8-37.3

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.5-3


Corral
Corral
2940
Water Tank
CLIPPER VALLEY
BOND HILLS
Mine
Mine
2562
Goldhammer Mine
3371
MOUNTAIN
MOUNTAINS
MIDDLE HILLS
2293
60
ED
50
ED
LANDMARK LINE
61.0
57.0
56.5
50.5
Danby
DANBY VALLEY
CADIZ SUMMIT
66

LEGEND

■ PROPOSED COMPRESSOR STATION

═ PROPOSED PIPELINE

▭ PROPOSED ALTERNATIVE PIPELINE

(120 KR) PIPELINE MILEAGE (INTERVAL: 10 MILES)

(120.5) IMPACT MILEAGE

▨ HIGH IMPACT

▥ MODERATE IMPACT

⁘ LOW IMPACT

Visual Resources,
El Dorado Mainline
MP 50-61

NORTH ⊕

Scale (appx.)
0 .5 1 3
Miles

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

term vegetation recovery rate. These impacts are significant (Figure 4.5-3).

MP 57-61, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of visual interest are the foothills of the Clipper Mountains. The pipeline would be in a remote are that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-3).

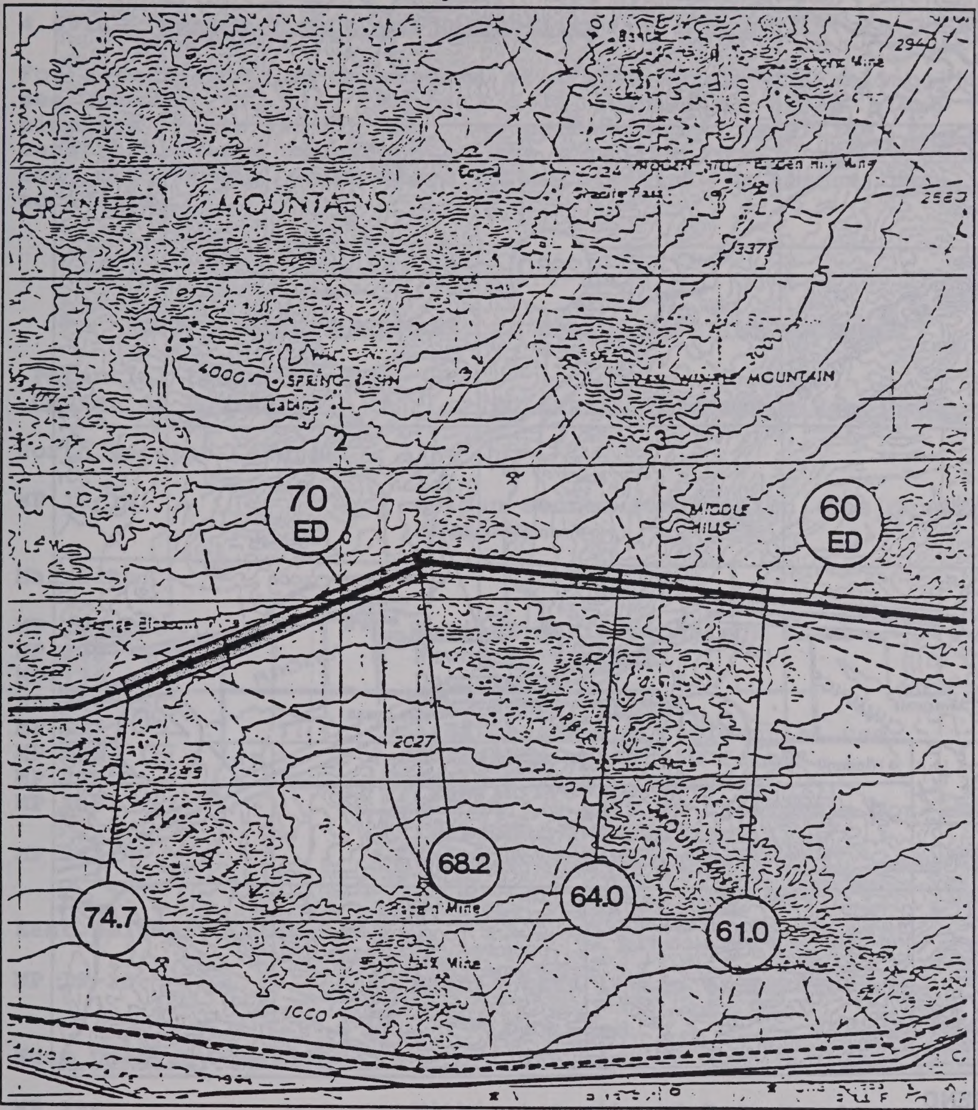
MP 61-64, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of visual interest are the foothills of the Marble Mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route will have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-4).

MP 64-68.2, VRM/VQO: BLM Class IIA
Description: This segment of the route would create a high visual impact. Of visual interest are the foothills of the Marble Mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route will have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-4).

MP 68.2-74.7, VRM/VQO: BLM Class IIB
Description: This segment of the route would create a high visual impact. Of visual interest are the foothills of the Old Dad Mountains. The pipeline would be in a remote area that would be seldom seen and not affect any critical views. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-4).

MP 235.5-236, VRM/VQO: Not Applicable
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would cross the Pacific Crest Trail and be a critical viewpoint for recreational hikers using the trail. Due to slow desert rejuvenation, the proposed route would have a long-term vegetation recovery rate. These impacts are significant (Figure 4.5-5).

Figure 4.5-4


GRANITE MOUNTAINS
SPRING BASIN
4000
Cabin
2
3
5
3371
2024
2940
2027
1000
MIDDLE HILLS
WHITE MOUNTAIN
Granite Pass
Mine
70
ED
60
ED
68.2
64.0
61.0
74.7

LEGEND

▣ PROPOSED COMPRESSOR STATION

PROPOSED PIPELINE

PROPOSED ALTERNATIVE PIPELINE

120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)

120.5 IMPACT MILEAGE

▒ HIGH IMPACT

▥ MODERATE IMPACT

⁘ LOW IMPACT

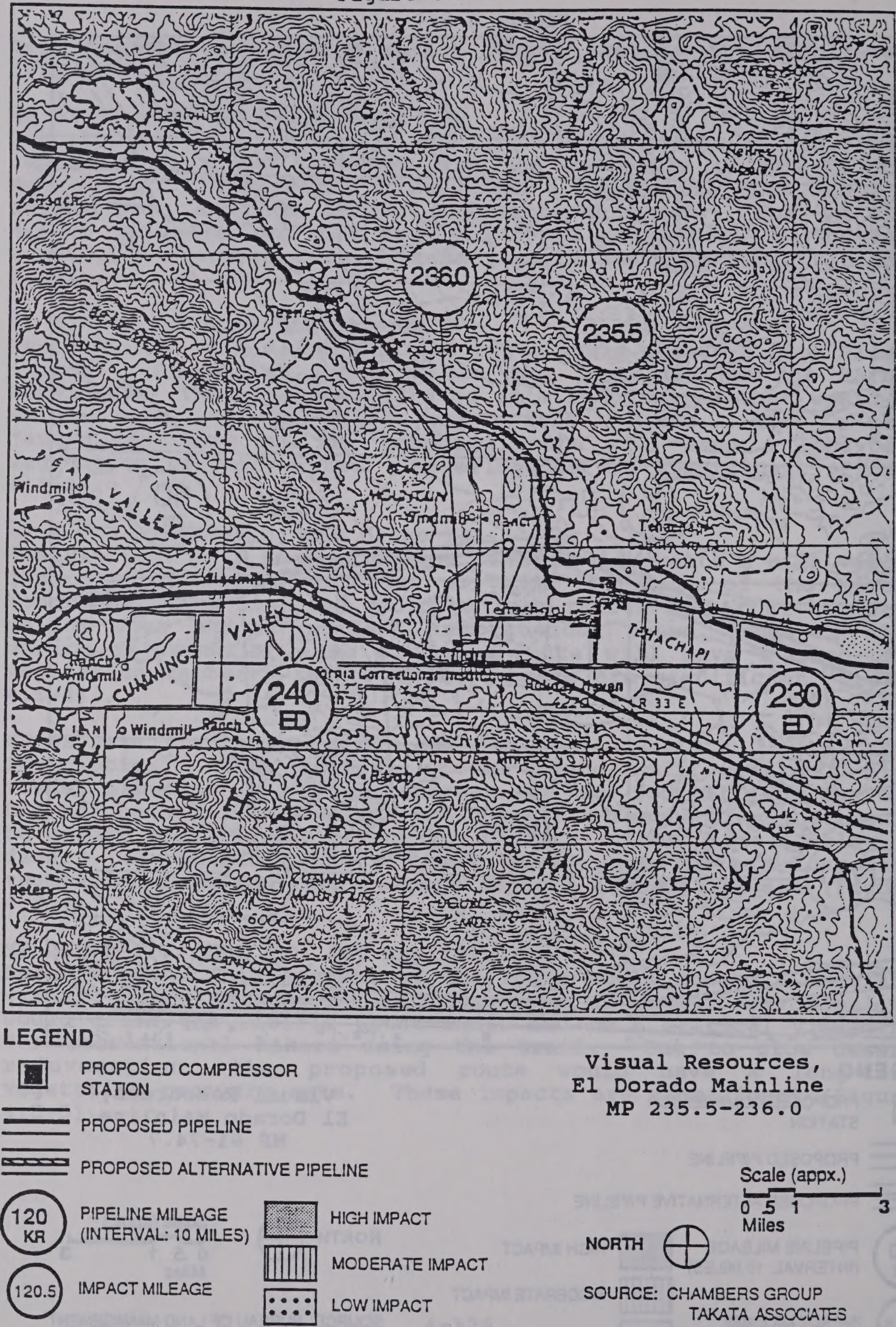
Visual Resources,
El Dorado Mainline
MP 61-74.7

NORTH ⊕

Scale (appx.)
0 .5 1 3
Miles

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.5-5


236.0
235.5
240 ED
230 ED
Tehachapi
TEHACHAPI
CUMMINGS
VALLEY
Windmill
Ranch
Cummings Mountain
7000
6000
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5 IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH

Visual Resources,
El Dorado Mainline
MP 235.5-236.0

SOURCE: CHAMBERS GROUP
TAKATA ASSOCIATES

4.5.13 System Safety and Reliability

For a more detailed discussion of system safety and reliability, see Section 4.2.13. Table 4.5-11 identifies areas along the pipeline route which may be particularly sensitive to the construction and operation of the pipeline from a safety aspect and also areas which have the potential to cause pipeline accidents.

Table 4.5-11

ROUTE ANALYSIS SUMMARY, EL DORADO PIPELINE PROPOSAL

Potential Location/ Causes of Accidents	Potential Vulnerable Resources
North Receipt Lateral:	
MP 12-14	Golden Shores Subdivision (residential housing)
Mainline:	
MP 100-180	Various fault crossings
MP 130	Newberry Springs
MP 136	Daggett
MP 140-150	USMC Supply Center
MP 197	Area leased for residential use
MP 215	Buildings within 50 feet
MP 229	Garlock Fault crossing
MP 240	Within 1/2 mile of California Correctional Institution
MP 263	White Wolf Fault crossing
East Delivery Lateral:	
MP 19-25	Within city limits of Bakersfield
West Delivery Lateral:	
MP 294	Within 1/2 mile of Taft Heights
MP 299	Within 1/2 mile of Fellows

4.6 EL DORADO ROUTE ALTERNATIVES

4.6.1 Alternative A

4.6.1.1 Air Quality

Air quality emissions and impacts would be nearly identical to those for the proposed primary route, which were presented in Section 4.4.1. Total overall construction emissions would be slightly higher since this alternative is 2.4 miles longer than the primary route.

4.6.1.2 Geology

The discussion on general geologic hazards and impacts caused by the construction, operation, and abandonment of the pipeline as well as a definition of significance criteria in Section 4.2.2 apply to this alternative. Table 4.5-1 lists the geologic hazards and impacts that would occur along the alternative if constructed.

4.6.1.3 Soil

Section 4.2.3.2.1 of the Mojave Pipeline Proposal which describes the Mojave Mainline between MP 37-110 also applies to Alternative A (MP 0-75.4). Table 4.6-1 lists the erosion and reclamation potential for this alternative.

4.6.1.4 Surface Water

No significant surface water resources would be crossed by the alternative route; therefore, no significant impacts would occur beyond the general impacts described in Section 4.2.4.

4.6.1.5 Groundwater

Impacts to groundwater would be the same as described for the Mojave Mainline in Section 4.2.5.2.

4.6.1.6 Freshwater Biology

The discussion of potential impacts to aquatic resources along the route of the Mojave Mainline MP 38-115 in Section 4.2.6 of this document also applies to this alternative.

Table 4.6-1

DISTRIBUTION OF SOIL IMPACTS, EL DORADO ALTERNATIVES

		Erosion Potential [1]						Reclamation Potential [2]		
		Water (miles) [3]			Wind (miles) [3]			(miles) [3]		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
Alternative A										
0-75.4	Mojave Desert	75.4	0.0	0.0	0.0	15.4	60.0	0.0	30.2	45.2
Alternative B										
0-8.3	Tehachapi Mtns.	4.0	2.0	2.3	1.5	6.8	0.0	3.1	3.7	1.5
Alternative C										
0-5.6	Tehachapi Mtns.	1.4	0.8	3.4	2.1	3.4	0.1	1.4	1.7	2.5

---

[1] Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

[2] Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use. Productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

[3] Cumulative miles for pipeline segment.

4.6.1.7 Terrestrial Biology

4.6.1.7.1 Vegetation

General Vegetation. Impacts would be the same as those described for the Mojave Mainline within MP 39-115. A total of 914 acres would be denuded, all within the Mojavean creosote bush scrub type. The loss would be a permanent Class I impact.

Plant Species of Special Concern. Five plant species of special concern, including four federal candidates and all of which are of concern to the CNPS, may occur in areas (914 acres) that would be traversed by this alternative. These species are listed in Appendix C. There is a high potential that these species would be significantly impacted by pipeline construction and operation.

4.6.1.7.2 Wildlife

Criteria used to determine significant impacts and general impacts associated with construction and operation of the proposed El Dorado Alternative A are the same as those described for the Mojave Mainline (Section 4.2.7.2).

General Wildlife. Significant and general impacts would be the same as discussed under the Mojave Region of the Mojave Mainline.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Mojave Desert Region of the Mojave Mainline, except for the extent of impacts to desert tortoise.

The route crosses nine miles of low density habitat (20-50 tortoise/mi^2). Using the assumptions made the Mojave section, six tortoises would potentially be lost due to construction. Construction activities would result in a loss of approximately 912 acres of desert tortoise habitat. This loss includes 109 acres of habitat within the designated density habitats described above, and an additional 803 acres of suitable habitat that is not currently identified with high tortoise densities. Loss of individuals and habitat would be Class I impacts as defined in Mojave. Additional impacts to this species are also described in this section.

4.6.1.7.3 Grazing

No significant impacts to grazing would occur as a result of El Dorado Alternative A.

4.6.1.8 Socioeconomics

4.6.1.8.1 Population, Housing, and Economic Impacts

See Section 4.2.8.1 for a discussion of impacts to San Bernardino County.

4.6.1.8.2 Traffic

Refer to the introductory paragraph in Section 4.2.8.2. No delays in traffic flow are anticipated since the paved roads, I-40 and U.S. 66, will be bored under and the county roads have light traffic.

4.6.1.8.3 Noise

Pipeline construction along Alternative A would cause the same types of impacts as those discussed in Section 4.2.8.3.

4.6.1.8.4 Recreational Resources

No impacts on developed recreational facilities are expected to occur since no facilities are present.

4.6.1.9 Land Ownership/Use

Since the Alternative A route follows the Mojave Mainline from Mojave MP 39-115.0, refer to Section 4.2.9.2.

4.6.1.10 Cultural Resources

See Section 4.2.10 for impact definitions.

4.6.1.10.1 Archaeology

Direct Impacts. Two known sites, a railroad grade and a lithic scatter, will be directly impacted. No surveys have been conducted in the direct impact zone.

Indirect Impacts. Six sites fall in the indirect impact zone. They include five lithic scatters and one rockshelter site.

There is one high sensitivity pipeline segment along this route.

4.6.1.10.2 American Indian Concerns

In addition to the general concerns expressed in Section 4.2.10.2, American Indians are concerned about impacts to the known ancestral (archaeological) sites listed above.

4.6.1.11 Paleontological Resources

See Section 4.5.11.

4.6.1.12 Visual Resources

MP 18.3-22.3, VRM/VQO: BLM Class IIA
Description: This segment of the route will create a moderate visual impact. Of special visual significance are the Marble Mountains. Critical views of eastbound and westbound motorists on Interstate 40 would be impacted. Slow desert rejuvenation would create a long-term vegetation recovery rate. These impacts are significant (Figure 4.6-1). Refer to Table 4.5-10 for a summary of visual impacts for Alternative A.

4.6.1.13 System Safety and Reliability

The Alternative A route would be approximately 2.4 miles longer than the primary route, and hence from a statistical perspective would have about the same probability of an incident as the primary route.

This route would traverse only remote areas and not pass near any residential areas. The geologic conditions are the same as for the Mojave primary route between MP 39 and MP 115.

4.6.2 Alternative B

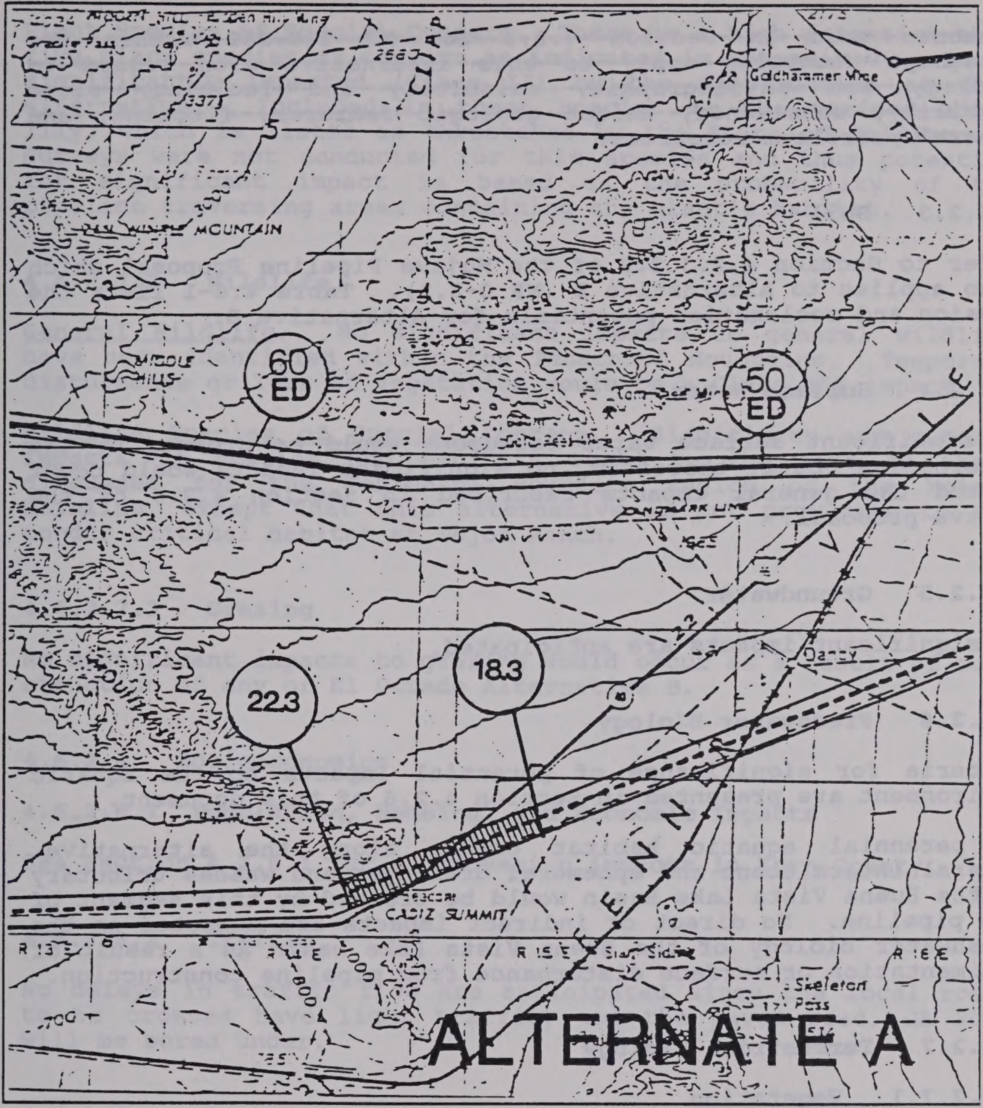
4.6.2.1 Air Quality

Air quality emissions and impacts would be nearly identical to those for the proposed primary route, which were presented in Section 4.4.1. Total overall construction emissions would be slightly lower since this alternative is about 2 miles shorter than the primary route.

4.6.2.2 Geology

The discussion on general geologic hazards and impacts caused by the construction, operation, and abandonment of the pipeline as well as a definition of significance criteria in Section 4.2.2 apply to this alternative. Table 4.5-1 lists the geologic hazards and impacts that would occur along the alternative if constructed.

Figure 4.6-1


2024
Granite Pass
2583
3371
Goldhammer Mine
2775
MOUNTAIN
MIDDLE HILLS
60
ED
50
ED
22.3
18.3
Danby
CADIZ SUMMIT
R 13 E
R 15 E
R 16 E
Skeleton Pass
ALTERNATE A

LEGEND

■ PROPOSED COMPRESSOR STATION

PROPOSED PIPELINE

PROPOSED ALTERNATIVE PIPELINE

120 KR — PIPELINE MILEAGE (INTERVAL: 10 MILES)

120.5 — IMPACT MILEAGE

▒ HIGH IMPACT

▥ MODERATE IMPACT

⁘ LOW IMPACT

Visual Resources,
El Dorado Alternative A
MP 18.3-22.3

Scale (appx.) 0 .5 1 3 Miles

NORTH ⊕

SOURCE: CHAMBERS GRP./SCOPING MTG.
TAKATA ASSOCIATES

~~Comments made in Section 4.2.2 for MP 240-250 within the Tehachapi Mountains apply to this alternative with regard to geology and physiographic, seismicity and faulting, slope stability, subsidence, unique geologic features, flooding, and mineral/petroleum resources.~~

4.6.2.3 Soil

Refer to Section 4.2.3.2.2 of the Mojave Pipeline Proposal which also applies to Alternative B (MP 0-8.3). Table 4.6-1 lists the erosion and reclamation potentials for Alternative B.

4.6.2.4 Surface Water

No significant surface water resources would be crossed by the alternative route: therefore, no significant impacts would occur beyond the general impacts described in Section 4.2.4 of the Mojave proposal.

4.6.2.5 Groundwater

No significant impacts are anticipated.

4.6.2.6 Freshwater Biology

Criteria for significance of potential impacts to the aquatic environment are presented in Section 4.2.6 of this document.

No perennial aquatic habitat occurs along the alternative. Several intermittent and ephemeral drainages and washes tributary to the Buena Vista Lake Basin would be crossed by this segment of the pipeline. No direct or indirect impacts are expected on the freshwater biology of the Buena Vista Lake basin as a result of sedimentation or surface disturbance from pipeline construction.

4.6.2.7 Terrestrial Biology

4.6.2.7.1 Vegetation

General Vegetation. A total of 100 acres of vegetation would be denuded due to the construction of this alternative. Of this total, approximately 12 acres of agricultural land, 88 acres of digger pine-oak woodland, and less than 0.1 acre of wetland/riparian would be denuded. All of this vegetation denudation would be considered a Class II impact. The loss of oak trees within the digger pine-oak woodland would be permanent. The other losses would be short term.

Plant Species of Special Concern. There is a high potential that five plant species of concern as indicated in Appendix C would be significantly impacted (Class II) by the construction of this alternative. Included in these species is the striped adobe lily, which is listed as threatened by the State of California. Surveys were not conducted for this species and thus potential for significant impact is based on the probability of the pipeline traversing areas containing the plant's habitat.

4.6.2.7.2 Wildlife

General Wildlife. No significant impacts to general wildlife have been identified within the Tehachapi Mountains. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Tehachapi Mountain region of the Mojave Mainline, except that this alternative is not proximate to the condor critical habitat at Tejon Ranch.

4.6.2.7.3 Grazing

No significant impacts to grazing would occur as a result of construction of any of El Dorado Alternative B.

4.6.2.8 Socioeconomics

4.6.2.8.1 Population, Housing, and Economic Impacts

See Section 4.2.8.1 for a discussion impacts in Kern County.

4.6.2.8.2 Traffic

No delays in traffic flow are anticipated since the local roads to be crossed have light traffic, and the paved road, CA 202, will be bored under.

4.6.2.8.3 Noise

Pipeline construction along Alternative B would cause the same types of impacts as those discussed in Section 4.2.8.3.

4.6.2.8.4 Recreational Resources

No impacts on developed recreational facilities are expected to occur since no facilities are present.

4.6.2.9 Land Ownership/Use

El Dorado's Alternative B would have short-and long-term impacts on the existing residential area of Bear Valley Springs and a significant impact to the planned development of the area. Refer to Section 3.5.2.9 for proximity and number of existing homes.

4.6.2.10 Cultural Resources

4.6.2.10.1 Archaeology

See Section 4.2.10 for impact definitions.

Direct and Indirect Impacts. No known cultural resources fall within these impact zones; however, only 3.0 percent of the direct impact zone has been surveyed.

4.6.2.10.2 American Indian Concerns

There are no specific Native American concerns.

4.2.6.11 Paleontological Resources

See Section 4.5.11.

4.6.2.12 Visual Resources

No visual impacts are anticipated.

4.6.2.13 System Safety and Reliability

The El Dorado Alternative B route would be approximately two miles shorter than the primary route, and hence from a statistical perspective would have about the same probability of an incident as the primary route. This alternative goes through the Bear Valley Springs subdivision between MP 240 and MP 250.

4.6.3 Alternative C

4.6.3.1 Air Quality

Air quality emissions and impacts would be nearly identical to those for the proposed primary route, which were presented in Section 4.5.1. Total overall construction emissions would be slightly lower since this alternative is 3.3 miles shorter than the primary route.

4.6.3.2 Geology

The discussion on general geologic hazards and impacts caused by the construction, operation, and abandonment of the pipeline as well as a definition of significance criteria in Section 4.2.2 apply to this alternative. Table 4.5-1 lists the geologic hazards and impacts that would occur along the alternative if constructed. ~~Comments made in Section 4.2.2 for MP 247-256 within the Tehachapi Mountains apply to this alternative.~~

4.6.3.3 Soil

The discussion on soil impacts presented in Section 4.2.3.2.2 of the Mojave Pipeline Proposal also applies to this Alternative C.

The probability for significant water erosion is predominantly high due to the steep hillslopes within the Tehachapi Mountains. The probability for significant wind erosion is predominantly moderate. Reclamation potential ranges from poor to good but is predominantly poor due to the steep slopes indicating the potential for significant revegetation problems. The distribution of potential impacts is presented in Table 4.6-1.

4.6.3.4 Surface Water

No significant surface water resources would be crossed by the alternative route; therefore, no significant impacts would occur.

4.6.3.5 Groundwater

No significant impacts are anticipated.

4.6.3.6 Freshwater Biology

No perennial aquatic habitat occurs along Alternative C.

4.6.3.7 Terrestrial Biology

4.6.3.7.1 Vegetation

General Vegetation. Approximately 61 acres of digger pine-oak woodland, seven acres of valley and foothill grassland, and less than 0.1 acre of wetland/riparian vegetation would be denuded due to the construction of the alternative. The loss of digger pine-oak woodland and wetland/riparian types would be considered significant (Class II), as discussed in Section 4.2.7.1 of the Mojave Proposal.

Plant Species of Special Concern. There is a high potential that 14 plant species of concern, all federal candidates as indicated in Appendix C, would be significantly impacted by the construction of the alternative. Included in these species are three California State listed species: California jewel flower, Tulare pseudobahia, and striped adobe lily.

Field surveys were conducted in June 1986 for California jewel flower and Bakersfield beavertail cactus. No individuals of these species were found along the alternative route. However, suitable habitat was identified only for the California jewel flower. Construction could significantly impact the species (Class II) by denuding approximately 10 acres of suitable habitat.

4.6.3.7.2 Wildlife

General Wildlife. No significant impacts to general wildlife have been identified within the Tehachapi Mountains. Temporary disturbance or loss of vegetation would be a Class III impact.

Wildlife Species of Special Concern. Significant and general impacts to species and habitats would be the same as those discussed for the Tehachapi Mountain region of the Mojave Mainline, except that this alternative is not proximate to the condor critical habitat at Tejon Ranch.

4.6.3.7.3 Grazing

No significant impacts to grazing would occur as a result of construction of any of El Dorado Alternative C.

4.6.3.8 Socioeconomics

4.6.3.8.1 Population, Housing, and Economic Impacts

See Section 4.2.8.1 for a discussion of impacts in Kern County.

4.6.3.8.2 Traffic

No delays in traffic flow are anticipated since only local roads with light traffic will be crossed.

4.6.3.8.3 Noise

Pipeline construction along Alternative C would cause the same types of impacts as those discussed in Section 4.2.8.3.

4.6.3.8.4 Recreational Resources

No impacts on developed recreational facilities are expected to occur since no facilities are present.

4.6.3.9 Land Ownership/Use

Alternative C would have no significant or long-term land use impacts.

4.6.3.10 Cultural Resources

See Section 4.2.10 for impact definitions.

4.6.3.10.1 Archaeology

Direct Impacts. Two bedrock mortar sites (one with an associated lithic-ceramic scatter) will be directly impacted. About 71.4 percent of the direct impact zone has been surveyed.

Indirect Impacts. Nine known cultural resources fall within the zone of indirect impact. They include seven bedrock mortar/milling sites, one probable habitation site with a milling feature, and a lithic scatter.

4.6.3.10.2 American Indian Concerns

In addition to the general concerns expressed in Section 4.5.10.2, American Indians are concerned about impacts to the known ancestral (archaeological) sites listed above.

4.6.3.11 Paleontological Resources

See Section 4.5.11.

4.6.3.12 Visual Resources

No visual impacts are anticipated.

4.6.3.13 Systems Safety and Reliability

The El Dorado Alternative C route would be approximately 3.3 miles shorter than the primary route, and hence from a statistical perspective would have about the same probability of an incident as the primary route. This route goes through remote areas and does not pass near any residential areas.

4.7 EL PASO EXPANSION PROPOSAL

4.7.1 El Paso Expansion Proposal: Base Case

This section provides information concerning impacts to the environment associated with the construction and operation of the 0/400 MMcfd El Paso Expansion Proposal.

4.7.1.1 Air Quality

4.7.1.1.1 Installation/Construction Emissions and Impacts

An air quality impact analysis was not performed for construction of the proposed El Paso Base Case, since none of the project's facilities would be constructed within California. The rationale for this is discussed in Section 4.2.1.1.

4.7.1.1.2 Operational Phase Emissions

No new operational emissions would occur under the Base Case since no new compressor units would be required.

4.7.1.2 Geology

The discussion of geological impacts includes both geologic hazards and potential impacts of the project on the geologic environment. The potential geologic hazards identified for the El Paso route are summarized in Table 4.7-1. Criteria used to delineate significant potential hazards and impacts to the geological environment may be found in Section 4.2.2. Implementation of the applicable mitigation measures in ~~Sections 4.9.5.2 and 4.9.6.2~~ Section 3.1.2 of Volume III would reduce the risks associated with geologic hazards to acceptable levels.

Table 4.7-1

SIGNIFICANT GEOLOGIC HAZARDS,
EL PASO BASE CASE

	Window Rock A Loop (MP 118.7-124.5)	Navajo A Loop (MP 156.5-165.5)
Liquefaction/Ground Failure	-	-
Slope Instability	X	X
Ground Subsidence	-	X
Flash Flooding	-	-
Surface Fault Rupture	-	-
Volcanism	-	-

4.7.1.2.1 Geology and Physiography

Construction of the ~~proposed El Paso route~~ El Paso proposed route and the 600 MMCfd alternatives would disturb the ground surface, the upper few feet of soil and/or rock material along the entire pipeline route. Because of the limited extent of the proposed route and the topographic nature of the area involved, few cut-and-fill slopes would be required. As geologic and geomorphic processes are slow in arid climates, impacts to the geology in areas where cuts and fills are required may be evident for tens to hundreds of years. However, these impacts are not considered to be significant.

4.7.1.2.2 Seismicity and Faulting

The project area is in a low to moderate seismic zone where significant ground shaking is not expected to occur. There is a very low probability that vibratory ground motions anticipated over the life of the project would be intense enough to cause significant soil liquefaction, lurching, or spreading.

4.7.1.2.3 Slope Stability

There is some risk of damage to the proposed El Paso route along both loops from natural slope instabilities due to climatic, geologic, and geomorphic conditions. Slope instability problems, where they may exist, could be ~~overcome~~ mitigated by proper geotechnical design. Due care would be necessary on steep slopes, however, to ensure that construction procedures did not increase the potential for slope instability.

4.7.1.2.4 Subsidence

~~Subsidence would not be expected to be significant along either loop of the proposal expansion.~~ With the exception of the Navajo A Loop the potential for subsidence is not considered to be significant.

4.7.1.2.5 Unique Geologic Features

No significant impacts to or due to unique geologic features are anticipated.

4.7.1.2.6 Flash Flooding

The proposed El Paso route crosses a number of arroyos and washes on alluvial fans and broad basins. These segments would be susceptible to flash floods due to intense rainfall events which frequently occur during summer months. Flash flooding is not considered likely to result in any significant adverse impacts on the pipeline due to the fact that the pipeline would be buried and that the intensity of the flash floods would not be sufficient to adversely affect any pipeline structures.

4.7.1.2.7 Mineral/Petroleum Resources

The primary concern to mineral resources is the potential preclusion of resource development over the life of the project if pipeline loops were constructed over areas containing economically recoverable mineral deposits. Since the pipeline loops would be constructed parallel to and 30 to 50 feet away from the existing El Paso Mainline, any areas containing recoverable deposits may have already been precluded from development. The area of preclusion may be slightly increased; however, no adverse impacts to current development or planned extraction of mineral or petroleum resources are expected to result from implementation of the project.

4.7.1.3 Soil

Potential impacts to soils along the route of the proposed El Paso Base Case are described below. Refer to Section 4.2.3 for a discussion on impacts that could occur as a result of pipeline construction as well as criteria used to delineate significant impacts. Distribution of potential impacts is summarized in Table 4.7-2. Refer to Appendix A for detailed information on soils along the route of the expansion.

Window Rock A Loop. The probability for significant water erosion along the route of this proposed expansion is low to moderate and the probability for significant wind erosion is moderate to high. About two-thirds of the route has good reclamation potential. One-third has poor reclamation potential, indicating significant revegetation problems.

Navajo A Loop. The probability for significant water erosion along the route of this proposed expansion is mostly low with only short segments on steeper slopes having moderate to high potential. The probability for significant wind erosion is low. Reclamation potential is poor indicating potential for significant revegetation problems.

4.7.1.4 Surface Water

The significance criteria presented in Section 4.2.4 also apply to this proposal. No significant impacts would be expected to result from construction and operation the proposed project. However, many of the impacts described in Section 4.2.4 apply to this proposed expansion as well.

Table 4.7-2

DISTRIBUTION OF POTENTIAL SOIL IMPACTS, EL PASO BASE CASE

		Erosion Potential [1]						Reclamation Potential [2]		
		Water (miles) [3]			Wind (miles) [3]			(miles) [3]		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
118.7-124.5	Window Rock A Loop Colorado Plateau	3.8	2.0	0.0	0.0	2.0	3.8	4.0	0.0	1.8
156.5-165.5	Navajo A Loop	6.5	1.5	1.0	9.0	0.0	0.0	0.0	0.0	9.0

---

[1] Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).
Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

[2] Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use. productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

[3] Cumulative miles for pipeline segment.

~~No specific plans for hydrostatic testing of new and existing portions of the pipeline have been presented. Most of the streams in the vicinity of the pipeline route are ephemeral to intermittent. Generally, the perennial streams flow with only minor discharge quantities and the streams are generally fully appropriated. Depending on the location and discharge of the water body utilized as a source of water for hydrostatic testing, the withdrawal of water in large quantities could significantly reduce natural flows such that instream water uses and downstream water uses could be impacted. Withdrawal rates could be as high as 7 cubic feet per second (cfs). Generally, water withdrawal would last for a very short period of time. However, if substantial dewatering occurs such that downstream water uses or instream uses were impacted, the impacts would be considered significant.~~ El Paso has stated in its application that all hydrostatic test water will be obtained from existing wells and reservoirs. It further stated that all hydrostatic test water will be disposed of in evaporation ponds located on or adjacent to El Paso's existing rights-of-way. If such procedures are strictly adhered to there will be no impacts to streams either during withdrawal or during discharge of the water. ~~The indiscriminant discharge of water used for hydrostatic testing could negatively impact surface water quality if residual chemicals associated with welding, construction machinery, or pipeline coating were transported with the water and discharged into or near a stream. Erosion of earth materials could occur if the discharge water was allowed to scour unprotected soils. Discharge rates could be as high as 5 cfs. These impacts associated with hydrostatic water discharge would be significant unless appropriate mitigation measures were implemented.~~

4.7.1.5 Groundwater

~~The significance criteria and discussion of impacts that could occur to groundwater resources presented in Section 4.2.5 also apply to this proposal.~~

No significant impacts are anticipated as a result of construction of the proposed project.

4.7.1.6 Freshwater Biology

No significant impacts to aquatic environments would result from construction of the proposed El Paso Base Case due to the absence of perennial aquatic habitat along the Window Rock A and Navajo A Loops. Some increased sediment loading would occur in intermittent and ephemeral habitats during construction but impacts to these habitats would not be significant. Refer to Section 4.2.6 for criteria used to determine significance of impacts on aquatic environments.

4.7.1.7 Terrestrial Biology

4.7.1.7.1 Vegetation

Criteria used to determine the significance of impacts associated with construction of the El Paso Base Case are the same as those discussed in Section 4.2.7.1 of the Mojave Mainline.

Denudation of vegetation would be the major impact associated with construction of the proposed loop expansions. Construction of the project would result in clearing a construction ROW approximately 100 feet wide. The clearing would take place in both existing ROW vegetation (approximately 40 feet) and native vegetation (approximately 60 feet) adjacent to the existing ROW. After construction, a 45-foot wide operational ROW would be maintained by not allowing large woody shrubs and trees to re-establish within the operational ROW. Consequently, large shrubs and trees would not revegetate a 5-foot wide zone adjacent to the existing ROW for the duration of the project, and thus would be a long term loss. Table 4.7-3 lists the acreage of each vegetation that would be denuded due to the construction of the El Paso Base Case.

The pinyon-juniper type has a fair or better revegetation potential. However, individual pinyon pine and juniper trees would take 20 to 30 years for the trees to become re-established, although the forb and grass component of the type would re-establish relatively quickly. Grassland and sagebrush scrub community types have a fair or better revegetation potential and should revegetate in a relatively short period of time assuming proper construction and reclamation techniques. Denudation of these types would be considered a Class III impact. A small amount (0.1 acre) of wetland/riparian vegetation may be denuded; this would be a significant short term impact (Class II). The wetland/riparian type would revegetate in the short term (10 years) due to its good or better revegetation potential.

Refer to Section 4.2.7.1 of the Mojave Proposal which discusses the potential for noxious and undesirable weed invasion within the ROW.

Window Rock A Loop. Approximately 70.3 acres of vegetation would be denuded due to construction of the proposed loop. None of this denudation would be considered significant. Due to the late identification of this proposal, Window Rock A loop was not surveyed for the presence of the federally endangered Peebles Navajo cactus. Since there is only a low potential that the species would occur along the loop, there is only a low potential that the species would be impacted by construction of the proposed loop. There is a potential that gladiator milkvetch, a federal candidate, would be significantly impacted. However, no survey for the species was conducted to substantiate its presence along the loop.

Table 4.7-3
VEGETATION TYPES AND DENUDED ACREAGES, EL PASO BASE CASE

			Denudation 1/ (acres)				
				Native Vegetation 4/			
Geographic Region/ Loop	Vegetation Type	Impact 2/ Class	ROW 3/	Short Term	Long Term	Permanent	Total
Colorado Plateau							
Window Rock A	Pinyon-juniper woodland	III	28.1	38.7	3.5	0	70.3
Navajo A	Plains grassland	III	19.4	29.1	0	0	48.5
	Pinyon-juniper woodland	III	24.2	33.3	3.1	0	60.6
		Subtotal	43.6	62.4	3.1	0	109.1
		TOTAL	71.7	101.1	6.6	0	179.4

1/ vegetation loss assuming a 100-foot wide construction ROW, 60 feet within native vegetation and 40 feet within existing ROW vegetation.

2/ see Section 4.2.7.1 for definitions of impact classes.

3/ denudation of existing ROW vegetation assuming a 40-foot wide zone of clearing within the ROW; does not ininclude native vegetation.

4/ native vegetation adjacent to existing ROW, denudation/disturbance 60 feet wide.

short-term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short term within the 60-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

long-term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (45-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; loss would not be significant. This loss would occur only within a 5-foot wide zone adjacent to the existing ROW as part of the 45-foot operational ROW.

permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant. This loss would occur only within the 60-foot wide portion of the 100-foot wide construction ROW within native vegetation.

Navajo A Loop. Approximately 109.1 acres of vegetation would be denuded due to the construction of the proposed loop. None of this denudation would be considered significant. This loop was surveyed for the presence of Peebles Navajo cactus and its required habitat. No individuals or required habitat were encountered and, therefore, no significant impact to the species would occur. There is a potential that gladiator milkvetch, a federal candidate, would be significantly impacted. However, no survey for the species was conducted to substantiate its presence along the loop.

Summary of Impacts. Implementation of the Base Case would denude approximately 180 acres of vegetation of which 108 acres would be native vegetation. The balance of the denudation would include existing ROW vegetation. None of the denudation would be significant. There is only a low potential that Peebles Navajo cactus and the gladiator milkvetch would be impacted by the construction of the proposed Base Case.

4.7.1.7.2 Wildlife

Criteria used to determine significant and general impacts associated with the construction and operation of the proposed El Paso Base Case are the same as those described for the Mojave Mainline (Section 4.2.7.2).

Window Rock A Loop. No significant impacts to general wildlife would occur along the proposed loop. Disturbance of general wildlife habitat would be a Class III impact.

Ferruginous hawks, Swainson's hawks and mountain plover could potentially nest along the proposed loop expansion. Disturbance of any nesting individuals of these species would be a Class II impact.

Navajo A Loop. No significant impacts to general wildlife would occur along the proposed loop. Disturbance of general wildlife habitat would be a Class III impact.

Ferruginous and Swainson's hawks potentially nest along this proposed loop. Disturbance to nesting individuals would be considered a Class II impact.

Summary of Significant Impacts:

General Wildlife. No significant impacts to general wildlife would occur along the proposed Base Case.

Wildlife Species of Special Concern. Both proposed loops cross potential nesting habitat for ferruginous and Swainson's hawks for a total of approximately 15 miles. Window Rock A Loop also crosses potential mountain plover nesting habitat for approximately six miles. No nests have been identified along the proposed loops. If active nests are present, disturbance during nesting would be a Class II impact.

4.7.1.7.3 Grazing

Criteria used to evaluate potential impacts to grazing along the route of the proposed El Paso Base Case are the same as those listed in Section 4.2.7.3 of the Mojave Proposal.

No significant impacts to grazing would occur since less than one percent of each allotment would be affected (see Appendix D) and the basic assumptions involving the maintenance of control and separation, revegetation, access, and time allowed for the trench to remain open, would be followed (Section 4.2.7.3.

4.7.1.8 Socioeconomics

4.7.1.8.1 Population, Housing, and Economic Impacts

The Base Case involves the Window Rock A Loop, a 5.8 mile long loop in Apache County, Arizona, and the Navajo A Loop, a 9.0 mile long loop in Navajo County, Arizona. Because the Base Case involves only a total of 14.8 miles of pipeline looping, and no additional facility construction, the socioeconomic impacts of the Base Case are insignificant for the most part.

Table 4.7-4 presents aggregate socioeconomic information for the Base Case and the two Alternatives. Due to a lack of data on the construction procedures to be employed for the El Paso project, Spread No. 2 from the Transwestern Proposal was used as the basis of analysis here. The construction duration was adjusted relative to the Transwestern project to reflect the difference in length of looping. As seen in the table, a construction crew of 350 will be required for 32 days to complete the project. An additional 27 personnel will be required on-site as well. Approximately one-third of the required labor will be found locally while the remaining 255 personnel will be imported to the region.

A survey in 1979 of pipeline construction workers found that for every inmigrant construction worker, .3 dependents also came to the area. Therefore, in this case, 77 dependents are forecast. The inmigrants are expected to demand 110 hotel/motel rooms, 71 rental units, 69 R/V campsites, and five other types of accommodations (Table 4.7-5). While the workforce is in Apache County constructing the Window Rock A Loop, the demand for motel rooms and R/V campsites will not be met in Apache County. Only 56 motel rooms exist in the county and no R/V spaces are found. The rental unit demand could be met within the county.

Table 4.7-4

AGGREGATE SOCIOECONOMIC IMPACT INFORMATION, EL PASO BASE CASE AND 600 MMcfd ALTERNATIVES

		100/500 Alternative Components					
Characteristics	Base Case	New Mexico Loops	Arizona Loops	Rewheel Activities	Bondad Compressor	Hackberry Compressor	200/400 Additional Loops
Location	Apache/ Navajo, AZ	San Juan/ Cibola, NM	Apac,/Nava./ Coco./Yava./ Mohave, AZ	Navajo/ Yavapai/ Mojave, AZ	La Plata, CO	Mohave, AZ	San Juan/ McKin., NM
Length (miles)	14.8	17.8	192	n/a	n/a	n/a	17.1
Construction duration (days)	32	38	414	29	150	150	37
Construction crew	350	350	350	145	145	145	350
Other personnel required for construction	27	27	27	11	11	11	27
Local construction personnel	122	122	122	51	51	51	122
Nonlocal construction personnel	255	255	255	105	105	105	255
Dependents of nonlocal personnel	77	77	77	32	32	32	77
Total immigrant population	332	332	332	137	137	137	332
Housing demand by immigrants (units):							
Hotels/Motels	110	110	110	45	45	45	110
Rental Units	71	71	29	71	29	29	71
R/V Campsites	69	69	69	28	28	28	69
Other	5	5	5	2	2	2	5
Local expenditures by nonlocal construction personnel	$ 557,668	$ 670,709	$7,234,613	$1,078,875	$1,078,876	$1,078,875	$644,333
Local expenditures by local construction personnel	567,109	682,063	7,357,085	213,769	1,113,840	1,113,840	655,240
Local expenditures by contractors	145,949	175,533	1,893,390	52,000	189,000	189,000	168,630
Operation Personnel Total = 0							

SOURCES:
Pipeline construction activities were assumed to be similar to Transwestern Spread No. 2. The duration of construction for the loops was adjusted based on length. Construction at the Bondad Compressor Station was assumed to be similar to construction of the Topock Compressor Station in the Mojave Project. Rewheel activities are assumed to require the same workforce size as a compressor installation. However, the duration of construction was assumed to be correspondingly less based on the relative construction costs (i.e. four rewheel activities at a total direct cost of $272,000 each compared to the Bondad Compressor Station total direct cost of $5,669,000 [El Paso Natural Gas Company, 1985]. Dependents were estimated at .3 dependents per immigrant [BLM, 1979]. Local expenditures for contractors were derived on a per mile basis from El Paso Project cost data [El Paso Natural Gas Company, 1985]. The exceptions were the rewhell and compressor addition activities which were explicitly given. No operation personnel are noted in the operation budgets for the project [op.cit.].

Table 4.7-5

HOUSING DEMAND DISTRIBUTION BY AFFECTED AREA, EL PASO BASE CASE AND 600 MMcfd ALTERNATIVES

	Temporary Housing									
	Hotel/Motel Rooms			Rental Units			RV Spaces			
State/County/City	Supply	Demand	%	Supply	Demand	%	Supply	Demand	%	Permanent Housing
ARIZONA										
Apache	56	110	196	492	71	14	0	69	[2]	782
Coconino	1,450 [1]	45	3	931			490	21	4	1,310
Flagstaff	2,121	65	3	234	71	30	1,169	48	4	330
Mohave	20 [1]	1	5	811			0	0	[2]	1,459
Kingman	1,480	95	6	64	38	59	328	29	9	116
Lake Havasu City	1,650	104	6	153	91	59	1,114	96	9	275
Navajo				646			100	35	35	1,038
Holbrook	748	99	13	23	38	168	152	53	35	36
Winslow	547	56	10	38	62	165	23	11	48	60
Yavapai	186	155	83	838	100	12	232	97	42	1,670
COLORADO										
La Plata	2,785 [1]	30	1	234			496	10	2	388
Durango	1,393	15	1	50	29	58	894	18	2	82
NEW MEXICO										
McKinley				343			194	0	0	482
Gallup	1,600	0	0	81	0	0	311	0	0	114
San Juan			1,176			355	58	17	1,521	
Farmington	1,200	110	9	422	71	17	61	11	18	545
Valencia (Includes Cibola)										
Belen	84	0	0	78	0	0	0	0	[2]	116
Grants	1,000	110	11	117	71	61	75	69	92	174

---

[1] Additional rooms and RV spaces in county near the ROW.
[2] Infinite percentage resulting from division by zero.

SOURCES: Hotel/Motel supply derived from Tables 3.2.8-1 and 3.2.8-4 of the Affected Environment Sections. Rental Units supply is calculated as those units for rent. Year-round supply is calculated as those units for rent or sale. Units listed as vacant awaiting occupancy or demolition, held for occasional use, or boarded up were not included. Due to a lack of data on rental unit or year-round unit available housing supply for individual cities, the relationship between the numbers of these types of units and total housing units in the county in which the city exists was used to adjust total vacant units in each individual city.

The likely result of the shortfall of motel rooms and R/V spaces will be commuting to Gallup, which is the closest city to the loop, (roughly twenty miles away). Gallup has a motel room supply of 1,600 and 311 R/V spaces available. An alternative would be a workcamp at the construction site in Apache County.

When the construction occurs in Navajo County, the demand for motel rooms and R/V spaces will most likely be met in Winslow and Holbrook. Combined, these two towns have 1,395 motel and hotel rooms and 175 R/V spaces. In addition, 100 R/V spaces are found in other areas in Navajo County near the pipeline right of way.

The estimated local expenditures by nonlocal labor is $68.50 per day, which is a weighted average across various accommodation types. The local expenditures by nonlocal labor for the Base Case will total just over a half million dollars. Resident labor will spend $14.56 locally for every hour they work and generate a similar amount of local spending. The pipeline contractors are expected to make almost $150,000 in local purchases during the construction period. These purchases will probably occur in Gallup, Winslow, and Holbrook.

In addition to local spending by the workforce and the contractors, the public finances of the two counties will be enhanced (Table 4.7-6). On average, a mile of loop costs $512,000 [El Paso Natural Gas Company, November, 1985]. Therefore, the 5.8 miles of loop in Apache County will add $3.0 million to the county assessed value. Similarly, the nine miles of looping in Navajo County will add $4.6 million to the total county assessed value. In relative terms, the increases in assessed value comprise 0.87 percent and 0.93 percent of the existing assessed value in Apache and Navajo counties, respectively.

4.7.1.8.2 Traffic

No traffic-related impacts are anticipated for either of the loops.

4.7.1.8.3 Noise

Section 4.2.8.3 details the general construction noise levels which would occur during the construction of the two loops needed to accomplish the El Paso Base Case. Increased noise levels associated with construction would be short-term, generally limited to daylight hours lasting fewer than 10 working days at any particular point along the proposed loops. Since the proposed loops are situated in rural areas, the impacts from noise caused by construction activities would not be considered significant.

Table 4.7-6

CONTRIBUTION TO COUNTY TAX BASE, EL PASO BASE CASE AND 600 MMcfd ALTERNATIVES

State/County	Length of Line (miles) Facilities	Estimated Taxable Value of Pipeline and Facilities (Millions)	Total 1984/1985 County Assessed Value (Millions)	Pipeline Percentage of Total Value	1984/1985 County Tax Revenues (Millions)
ARIZONA					
Apache	37.5	$ 19.2	$ 343.0	5.60%	$18.7
Coconino	50.4	25.8	488.4	5.28	28.1
Mohave	24.5 Hackberry Compressor One Rewheel Alter. meter runs	18.8	377.7	4.97	36.2
Navajo	49.6 One Rewheel	25.7	497.2	5.16	30.8
Yavapai	30.0 One Rewheel	15.6	448.0	3.49	39.0
COLORADO					
La Plata	Bondad Compressor	5.7	250.7	2.27	18.3
NEW MEXICO					
McKinley	0.0	0.0	451.2	0.0	10.4
San Juan	14.6	7.5	1,529.0	0.49	30.8
Valencia (Includes Cibola)	3.2	1.6	144.7	1.13	4.1

SOURCE: Value of all El Paso pipeline loops and facilities derived from data submitted in November 1985 application [El Paso Natural Gas Company, 1985]. Local tax data obtained from Arizona State Department of Revenue, La Plata County Commissioner's Office, and State of New Mexico Department of Finance and Administration.

4.7.1.8.4 Recreational Resources

No impacts on the dispersed recreational activities are expected to occur.

4.7.1.9 Land Ownership/Use

El Paso's Base Case land use impacts will be assessed according to the degree of conflict between the proposed routing and existing land uses or policies regarding land use.

Window Rock A and Navajo A loops have no identified land use conflicts.

Table 4.7-7 shows the number of acres that would be disturbed by each loop by land ownership category. Table 4.7-8 shows the number of acres that would be disturbed by land use category.

Table 4.7-7

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, EL PASO BASE CASE

Loop	County, State	Disturbance Area	Total Acres	Private Acres	Indian Acres
Window Rock A	Apache, AZ	60' Construction/ Operation	42.2		42.2
Navajo A	Navajo, AZ	60' Construction/ Operation	65.5	29.1	36.4

Table 4.7-8

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE, EL PASO BASE CASE

Loop	County, State	Disturbance Area	Total Acres	Grazing/ Rangeland Acres
Window Rock A	Apache, AZ	60' Construction/ Operation	42.2	42.2
Navajo A	Navajo, AZ	60' Construction/ Operation	65.5	65.5

4.7.1.10 Cultural Resources

See Section 4.2.10.1 for impact definitions.

4.7.1.10.1 Archaeology

Window Rock A Loop. This loop contains no known sites. No surveys conducted to BLM standards have been done within the direct impact zone.

Navajo A Loop. One known site lies in the zone of ~~indirect~~ direct impact, a prehistoric structure and associated trash. No surveys conducted to BLM standards have been done in the direct impact zone.

Two known sites fall within the ~~direct~~ indirect impact zone, a ceramic scatter and an historic Navajo structure.

All Loops. ~~Two~~ One site lies within the direct impact zone and ~~one~~ two sites lie in the zone of indirect impact. Note, however, that only 0.6 percent of the direct impact zone has been surveyed to BLM standards.

4.7.1.10.2 American Indian Concerns

The two proposed expansion loops cross portions of the Navajo Indian Reservation. The Navajo are concerned about impacts to archaeological and sacred sites, especially burials. Sacred sites include a wide range of types, including the location of sacred plants and animals used in ceremonies. [A more detailed discussion of sacred site types is presented in the Cultural Resources Technical Report]. In addition, some Navajo tribal and chapter representatives expressed concern about impacts to livestock and wish to be informed about fencing and livestock control during the construction period. They are also concerned that the project employ local people.

4.7.1.11 Paleontological Resources

No known fossil localities occur within the corridor of the two loops of the El Paso Base Case. Table 4.7-9 lists the impact mileages broken down by significance criteria and by loop.

A detailed discussion of the geologic formations, the fossils present, and the milepost locations of the formations have been discussed in the Paleontological Resources Assessment Technical Report [Morales et al., 1987].

Table 4.7-9

PALEONTOLOGIC FORMATIONS IMPACT MILEAGES,
EL PASO BASE CASE

Loop	Total Route Miles	Impact Mileages Undetermined	Insignificant	Significant
Window Rock A	5.8	0.0	0.0	5.8
Navajo A	9.0	0.0	0.8	8.2

4.7.1.12 Visual Resources

Methods for assessing impacts on visual resources are presented in Section 4.2.12.

Window Rock A Loop, MP 118.7-124.5, VRM: N/A
No significant visual impacts are anticipated.

Navajo A Loop, MP 156-6-165.5, VRM: N/A
No significant visual impacts are anticipated.

4.7.1.13 System Safety and Reliability

For a more complete discussion of system safety and reliability, refer to Section 4.2.13. The proposed looped sections are along unpopulated areas. None of the loops cross any faults or any areas with known slope instabilities.

4.7.2 El Paso 600 MMcfd Alternatives

This section provides information concerning impacts associated with the construction and operation of the 100/500 MMcfd and the 200/400 MMcfd El Paso Alternatives.

4.7.2.1 Air Quality

4.7.2.1.1 Project Emissions

Installation/Construction Emissions and Impacts

An air quality impact analysis was not performed for construction of the proposed El Paso Expansion Proposal, since none of the project's facilities would be constructed within California. The rationale for this is discussed in Section 4.2.1.1.1.

Operational Phase Emissions

The 100/500 Alternative would require the installation of a new 3,580 hp compressor unit at the existing Bondad Compressor Station and the installation of a new 5,300 hp compressor unit at the existing Hackberry B Compressor Station. The 200/400 Alternative would require two new 3,580 hp units at Bondad and a new 5,300 hp compressor unit at the existing Hackberry B station. Each compressor was assumed to operate continuously at 100 percent load. Additional combustion emissions were assumed to result from weekly testing of an emergency generator, which was also assumed to be operating during the worst hour. Emissions from the two existing 2,391 hp units at Bondad and the two 6,950 hp units at Hackberry B were also considered in the analysis since the nearest background station is too far away to show the effects of the existing emissions. Stack parameters and emission rate data for these existing units was provided by the applicant.

No_x, HC, and CO emission estimates were based on AP-42 [EPA, 1985] emission factors. Worst-hour and annual emission estimates from the Bondad and Hackberry compressor stations are summarized in Table 4.7-10. SO_2 and particulate emissions would be negligible. Fugitive hydrocarbon emissions from valves, flanges, etc. would be negligible. Whatever small emissions would be primarily photochemically nonreactive. Additional information concerning production phase emissions can be found in the Air Quality/Meteorology Technical Report.

Short and long-term impacts from operations at the compressor stations are presented in Table 4.7-11 through 4.7-13.

Table 4.7-10

WORST-HOUR AND ANNUAL EMISSION ESTIMATES FOR COMPRESSOR UNITS, EL PASO 600 MMcfd ALTERNATIVES

	THC	NO_x	SO_2	CO	TSP	PM10
	Bondad Compressor Station (100/500 MMcfd)					
Worst-Hour Emissions (lb/hr)	4.01	18.54	0.02	4.99	0.00	0.00
Annual Emissions (tons/yr)	3.22	45.69	0.06	17.28	0.00	0.00

Table 4.7-10 (continued)

WORST-HOUR AND ANNUAL EMISSION ESTIMATES FOR COMPRESSOR UNITS,
EL PASO 600 MMcfd ALTERNATIVES

	THC	NO_x	SO_2	CO	TSP	PM10
Hackberry Compressor Station (100/500 MMcfd)						
Worst-Hour Emissions (lb/hr)	4.36	23.53	0.02	6.88	0.00	0.00
Annual Emissions (tons/yr)	4.73	67.53	0.09	6.99	0.00	0.00
Bondad Compressor Station (200/400 Mmcfd)						
Worst-Hour Emissions (lb/hr)	4.73	28.92	0.03	8.93	0.00	0.00
Annual Emissions (tons/yr)	6.36	91.16	0.13	34.52	0.00	0.00

4.7.2.2 Geology

The discussion of geologic impacts includes geologic hazards and potential impacts of the project on the geologic environment. The potential geologic hazards identified for the El Paso Alternatives are summarized in Table 4.7-14. Criteria used to delineate significant potential hazards and impacts to the geological environment may be found in Section 4.2.2. Implementation of the mitigation measures in Sections 4.10.3.2 would reduce the risks associated with geologic hazards to acceptable levels.

4.7.2.2.1 Geology and Physiography

See ~~Section 4.7.1.2.1~~ Table 4.7-14 for a description of geologic and geomorphic impacts to all loops in the El Paso 600 MMcfd Alternatives.

4.7.2.2.2 Seismicity and Faulting

No known Quaternary faults have been observed to cross any of the El Paso Alternative loops. See Section 4.7.1.2.2 for additional information.

Table 4.7-11

WORST-HOUR AND ANNUAL OPERATIONS AT BONDAD STATION, 100/500 ALTERNATIVE
(all values are in ug/m3)

Pollutant	Avg. Time	State and Federal Standards		Project Impacts		
		Primary	Secondary	Project Increment	Background	Total
WORST-HOUR						
Carbon Monoxide (CO)	1-hr	40,000	40,000	28	23,000	23,028
	8-hr	10,000	10,000	20	8,000	8,020
Sulfur Dioxide (SO2)	3-hr	--	1,300	0	707	707
	24-hr	365	--	0	131	131
Total Suspended Particulates (TSP)	24-hr (Geo. Mean)	260	150	0	182	182
ANNUAL						
Nitrogen Dioxide (NO2)		100	100	18	0	18
Sulfur Dioxide (SO2)		80	--	0	26	26
Total Suspended Particulates (TSP)		75	60	0	60	60

Background values were taken from:
CO - Farmington (NM)
NO2 - Navajo Reservation (NM)
SO2 - Navajo Reservation (NM)
TSP - Durango (CO)

Table 4.7-12

WORST-HOUR AND ANNUAL OPERATIONS AT BONDAD STATION, 200/400 ALTERNATIVE
(all values are in ug/m3)

		State and Federal Standards		Project Impacts		
Pollutant	Avg. Time	Primary	Secondary	Project Increment	Background	Total
WORST-HOUR						
Carbon Monoxide (CO)	1-hr	40,000	40,000	31	23,000	23,031
	8-hr	10,000	10,000	22	8,000	8,022
Sulfur Dioxide (SO2)	3-hr	--	1,300	0	707	707
	24-hr	365	--	0	131	131
Total Suspended Particulates (TSP)	24-hr (Geo. Mean)	260	150	0	182	182
ANNUAL						
Nitrogen Dioxide (NO2)		100	100	26	0	26
Sulfur Dioxide (SO2)		80	--	0	26	26
Total Suspended Particulates (TSP)		75	60	0	60	60

Background values were taken from:
CO - Farmington (NM)
NO2 - Navajo Reservation (NM)
SO2 - Navajo Reservation (NM)
TSP - Durango (CO)

Table 4.7-13

WORST-HOUR AND ANNUAL OPERATIONS AT HACKBERRY B STATION, ARIZONA
(all values are in ug/m3)

Pollutant	Avg. Time	State and Federal Standards		Project Impacts		
		Primary	Secondary	Project Increment	Background	Total
WORST-HOUR						
Carbon Monoxide (CO)	1-hr	40,000	40,000	39	19,000	19,039
	8-hr	10,000	10,000	27	8,000	8,027
Sulfur Dioxide (SO2)	3-hr	--	1,300	0	115	115
	24-hr	365	--	0	42	42
Total Suspended Particulates (TSP)	24-hr (Geo. Mean)	260	150	0	215	215
ANNUAL						
Nitrogen Dioxide (NO2)		100	100	24	31	55
Sulfur Dioxide (SO2)		80	--	0	27	27
Total Suspended Particulates (TSP)		75	60	0	93	93

Background values were taken from:
CO - Flagstaff (AZ)
NO2 - Bullhead City (AZ)
SO2 - Bullhead City (AZ)
TSP - Bullhead City (AZ)

Table 4.7-14

SIGNIFICANT GEOLOGIC HAZARDS, EL PASO 600 MMcfd ALTERNATIVES

Milepost	Alternative Loop	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence	Flash Flooding
14.6-0.0	Blanco	-	-	X	-	X
12.8-19.3	Chaco	-	-	-	-	X
43.6-49.0	White Rock	-	-	-	-	X
65.1-70.3	Gallup	-	-	-	-	X
85.3-117.0	Window Rock B	X	-	X	X	X
118.7-124.5	Window Rock A	X	-	X	X	X
152.4-193.1	Navajo B	-	-	-	-	-
156.5-165.5	Navajo A	X	-	-	X	-
229.6-250.3	Leupp	-	-	X	-	-
263.6-276.9	Williams A	-	-	X	-	-
283.4-299.8	Williams B	-	-	X	-	-
317.6-347.6	Seligman	-	-	-	-	-
415.9-441.9	Hackberry	-	-	-	-	-

4.7.2.2.3 Slope Stability

Only the Blanco, Window Rock, ~~A and B, and Navajo~~ Leupp and Williams loops have any potential for natural slope stability problems. On locally steep slopes along the loop routes, slides and rockfall may occur due to above-normal rainfall, seismic shaking, construction grading, or other natural or man-made causes. Failure of the line may occur due to shearing of the pipeline because of differential movement of the ground, loss of support due to movement of material from beneath the pipeline, and crushing of the pipe by overriding soil or rock. The existing loops have experienced no failure from slope stability during their operational lifetime of over 35 years.

4.7.2.2.4 Subsidence

With the exception of the potential for coal removal and subsequent subsidence along the Window Rock B, Window Rock A, and Navajo A Loops, no other potential impacts from subsidence are anticipated on any of the El Paso Alternative loops.

4.7.2.2.5 Unique Geologic Features

Based on the currently available information, the risk of damage from renewed volcanic activity at the volcanic fields northwest of Flagstaff, Arizona, is judged to be low. No other significant impacts from or to unique geologic features are anticipated on any of the loops of the El Paso Alternative.

4.7.2.2.6 Flash Flooding

The Blanco, Chaco, White Rock, Gallup, Window Rock A and B Loops all have potential for being impacted by flash flooding. ~~See section 4.7.1.2.6 for potential impacts and significance characterization on all loops of the El Paso Alternative.~~ Appropriate mitigation measures, including adequate burial depth or properly reinforced aerial crossings, in conjunction with periodic pipeline ROW monitoring of erosion hazards, would minimize the potential for significant impact.

4.7.2.2.7 Mineral/Petroleum Resources

See Section 4.7.1.2.7 for potential impacts to mineral/petroleum resources for all loops of the El Paso Alternative.

4.7.2.3 Soil

The discussions presented in Sections 4.2.3 and 4.7.1.3 apply to this alternative. Distribution of potential impacts to soils for the 600 MMcfd Alternatives in Table 4.7-15.

Blanco Loop. The probability for significant water erosion along the route of this loop is low to moderate but mostly low, with high potential only occurring on short segments with steeper slopes. The probability for significant wind erosion is mostly moderate, with high potential only on short segments. The dominantly poor reclamation potential indicates potential for significant revegetation problems.

Window Rock B Loop. The probability for significant water erosion along the route of this expansion is mostly low and moderate, with only short segments on steeper slopes having high potential. The probability for significant wind erosion is mostly moderate. Reclamation potential is evenly distributed from good to poor range, with a high potential for significant revegetation problems on about one-third of the loop.

Window Rock A Loop. See Section 4.7.1.3.

Navajo B Loop. The probability for significant water and wind erosion along the route of this expansion is mostly low with a high probability for significant water erosion only occurring on short segments with steeper slopes. Reclamation potential ranges from good to poor but is mostly poor, with potential for significant revegetation problems on about one-half to two-thirds of the loop.

Navajo A Loop. See Section 4.7.1.3.

Leupp Loop. The probability for significant water and wind erosion is low to moderate. Reclamation potential is mostly fair and poor, indicating significant reclamation problems on about one-third to one-half of the loop.

Williams A Loop. The probability for significant water and wind erosion along the route of this expansion is mostly low and moderate. Reclamation potential is fair and poor, indicating potential for significant revegetation problems on about one-half of the loop.

Williams B Loop. The probability for significant water erosion is mostly low, with a high potential only on short segments with steeper slopes. The probability for significant wind erosion is mostly low. Reclamation potential is fair to poor, indicating significant revegetation problems on two-thirds to three-fourths of the route.

Seligman Loop. The probability for significant water and wind erosion along the route of this expansion is mostly low, with a

Table 4.7-15

DISTRIBUTION OF POTENTIAL SOIL IMPACTS, EL PASO 600 MMcfd ALTERNATIVES

		Erosion Potential 1/						Reclamation Potential 2/ (miles) 3/		
		Water (miles) 3/			Wind (miles) 3/					
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
14.6-0	Blanco Loop Colorado Plateau	7.0	4.6	3.0	0.0	10.6	4.0	2.6	0.0	12.0
85.3-117.0	Window Rock B Loop Colorado Plateau	19.0	8.2	4.5	3.0	28.7	0.0	10.7	11.0	10.0
118.7-124.5	Window Rock A Loop Colorado Plateau	3.8	2.0	0.0	0.0	2.0	3.8	4.0	0.0	1.8
152.4-193.1	Navajo B Loop Colorado Plateau	32.7	6.0	2.0	21.1	18.6	1.0	11.2	6.0	23.4
156.5-165.5	Navajo A Loop Colorado Plateau	6.5	1.5	1.0	9.0	0.0	0.0	0.0	0.0	9.0
229.6-250.3	Leupp Loop Colorado Plateau	11.0	9.7	0.0	20.2	0.5	0.0	0.5	11.7	8.5
263.6-276.9	Williams A Loop Colorado Plateau	6.7	6.6	0.0	10.0	3.3	0.0	0.0	6.7	6.6
283.4-299.8	Williams B Loop Colorado Plateau	9.0	6.0	1.4	15.0	1.4	0.0	0.0	4.6	11.8
317.6-347.6	Seligman Loop Colorado Plateau	17.0	10.0	3.0	30.0	0.0	0.0	0.0	9.0	21.0
415.0-441.9	Hackberry Loop Mojave Desert	23.0	3.9	0.0	2.7	19.0	5.2	8.6	0.0	18.3
330.1-332.2 333.8-334.5 337.5-337.8	Laguna Loop Colorado Plateau	2.9	0.0	0.0	1.0	1.9	0.0	1.0	1.0	0.9
12.9-19.4	Chaco Loop Colorado Plateau	6.5	0.0	0.0	0.0	3.5	3.0	1.0	2.5	3.0
43.6-49.0	White Rock Loop Colorado Plateau	6.5	1.0	1.0	2.4	1.5	1.5	1.5	0.5	3.4
65.1-70.3	Gallup Loop Colorado Plateau	4.7	0.5	0.0	1.2	4.0	0.0	2.0	2.4	0.8

1/ Water Erosion Potential: L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts). M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts). H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts). Wind Erosion Potential: L(low) = low probability for significant erosion impact. M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds. H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

2/ Reclamation Potential: Ratings are based upon trenching with no selective soil handling or other mitigation. G(good) = good probability for restoring vegetation which will support pre-existing land use. Productivity potential may be somewhat reduced. F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced. P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

3/ Cumulative miles for pipeline segment.

high potential for significant water erosion only occurring on short segments with steeper slopes. Reclamation potential is fair to poor but mostly poor, indicating potential for significant revegetation problems on about two-thirds of the route.

Hackberry Loop. The probability for significant water and wind erosion is mostly low and moderate, respectively, except some segments have high wind erosion probability. Reclamation potential is poor on about two-thirds of the route, indicating significant revegetation problems.

Laguna Loop (100/500 only). The probability for significant water erosion is low, and the probability for significant wind erosion is low to moderate. Reclamation potential is good to poor, indicating significant revegetation problems on about one-third of the route.

Chaco Loop (200/400 only). The probability for significant water erosion along the route of this expansion is low, and the probability for significant wind erosion is divided between moderate and high. Reclamation potential is mostly poor, with about one-half of the route having a high probability for significant revegetation problems.

White Rock Loop (200/400 only). The probability for significant water and wind erosion along the route of this expansion is mostly low, with moderate and high probabilities occurring on shorter segments. Reclamation potential is mostly poor with a high probability for significant problems occurring on one-half to two-thirds of the route.

Gallup Loop (200/400 only). The probability for significant water and wind erosion along the route of this expansion is mostly low and moderate, respectively. Reclamation potential is mostly good and fair, indicating significant revegetation problems are not anticipated.

4.7.2.4 Surface Water

The significance criteria presented in Section 4.2.4 apply to this alternative. No significant impacts would be anticipated as a result of constructing and operating the project. However, many of the impacts described in Section 4.2.4 apply to this project.

The existing Permian/San Juan Pipeline would be hydrostatically tested under the 100/500 MMcfd case between MP 324.9-362.5. ~~No specific plans for a water source have been presented. It is likely that the Rio San Jose would be used as a source. Average flow for the stream as gauged at USGS Station 08343500 near Grants, New Mexico, is 6.7 cfs with a minimum and maximum flow of 1.9 cfs and 1,400 cfs, respectively. The relatively minor flow experienced by the stream and the fully appropriated water rights associated with the stream indicate that even a modest withdrawal~~

~~of water for hydrostatic testing would significantly impact the stream. However, this impact would be short lived.~~ El Paso has stated that all water for hydrostatic testing will be obtained from wells or reservoirs and thus no impact would occur to surface water. Discharge of hydrostatic test water would be into approved basins rather than into streams. ~~No specific plans have been presented for discharging the test water. It is likely that discharge of the water would cause significant soil erosion and introduction of sediment and poor quality water, as discussed in Section 4.7.1.4, into some drainage channel in the vicinity of the point of discharge.~~

4.7.2.5 Groundwater

~~The significance criteria and discussion of impacts that could occur to groundwater resources presented in Section 4.2.5 also apply to this proposal.~~

Potential groundwater impacts could occur along 3.1 miles of the 100/500 alternative at the Laguna Loop. The probability of these impacts would be low.

4.7.2.6 Freshwater Biology

Implementation of the El Paso 600 MMcfd Alternatives would impact only one marginally perennial aquatic habitat, Black Creek. Most drainages impacted would be intermittent or ephemeral streams. Construction activities would result in short-term increases in sediment loads in these streams, which can adversely affect fish, aquatic insects and other aquatic organisms. The short-term duration of the impacts and the limited nature of the aquatic resources present in intermittent streams of the area indicates that no significant impacts would be expected in these temporary habitats.

~~Short-term significant impacts could result from the withdrawal and discharge of water for hydrostatic testing of the pipeline along the Laguna Loop, however, the location of the withdrawal and discharge site has not been identified. In addition,~~ Since no surface water streams would be involved in either the withdrawal or discharge of hydrostatic test water, no impacts to surface water caused by hydrostatic testing would occur. Potential impacts associated with fuel storage and refueling of vehicles exist but are not expected to be significant. Refer to Section 4.2.6 for criteria used to delineate significant impacts to aquatic environments. No significant impacts are anticipated to occur.

4.7.2.7 Terrestrial Biology

4.7.2.7.1 Vegetation

The significance criteria presented in Section 4.2.7.1 also apply to this alternative. Comments made concerning impacts to vegetation presented in Section 4.7.1.7.1 of the El Paso Base Case apply to this alternative as well.

In addition to the discussion presented in Section 4.7.1.7.1, the following applies to the 600 MMcfd alternatives. The duration of impacts associated with removal of vegetation types would vary widely with respect to the inherent revegetation potential for each type, which is generally inversely related to aridity [Vasek et al., 1975]. Revegetation of arid communities, such as the Mojavean creosote bush scrub, would require 70 years or more before a natural state is realized [Lathrop and Archbold, 1980; Vasek et al., 1975]. Denudation of this vegetation type would be a permanent Class I impact.

Long-lived species such as ponderosa pine, pinyon pine and juniper would also require a long period of time to return to preconstruction conditions, although the fair or better revegetation potential of the community types associated with these species would allow for relatively rapid revegetation with forbs and grasses. Denudation of pinyon-juniper vegetation would be long term within the operational ROW and short term within the construction ROW. The denudation of this type would be a Class III impact.

Denudation of ponderosa pine woodland vegetation would be considered long term within the operational ROW and short term within the construction ROW. The denudation of this type would be considered a Class II impact since the economic loss of the timber resource could be significant.

Grassland and sagebrush scrub community types also have fair or better revegetation potentials and assuming proper construction and reclamation techniques, should revegetate in a relatively short period of time. Denudation of these types would be considered a Class III impact.

Denudation of the wetland/riparian type would be short-term due to the relatively high revegetation potential. However, the importance of this type as a component of stream systems as well as their uniqueness as a wildlife habitat make denudation within this type significant (Class II). Additionally, the loss of agricultural ~~land~~ productivity associated with the Navajo Indian Irrigation Project would be considered significant (Class II).

Refer to Section 4.2.7.1 which discusses the potential for noxious and undesirable weed invasion.

Construction and operation of the 212 miles of loop in the 100/500 alternative and 225 miles in the 200/400 alternative would denude approximately 2,560 and 2,730 acres of vegetation, respectively. Table 4.7-16 lists the seven vegetation types occurring along the expansion loops and the acreage of each type that would be removed by construction of each loop.

Six federally listed plant species as itemized in Table 3.6-16 have a potential of occurring along the loops. Field surveys were conducted by qualified field botanists in July 1986 along portions of the routes identified as containing potential habitat. The results of the survey are included in the following discussions. Appendix C lists all the species of concern along the project loops which may be impacted. The loss of individuals of species of special concern and required habitat would be considered significant (Class II).

Blanco Loop. Approximately 177 acres of vegetation would be denuded, of which 106 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant denudation of vegetation (Class II) would be the 0.2 acre of riparian zone vegetation along intermittent drainages. Field surveys revealed no individuals of Knowlton cactus or Mancos milkvetch, nor was suitable habitat identified along the route of this loop. However, there may be isolated individual Knowlton cactus plants that were transplanted in the 1960's and 1970's along the loop that could be impacted by construction activities. One federal candidate species could be significantly impacted by construction of the loop, although field survey for the species would be required to substantiate such an impact.

Window Rock B Loop. Approximately 384 acres of vegetation would be denuded of which 230 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant losses of vegetation would include 80 acres of ponderosa pine woodland and 0.2 acre of wetland/riparian vegetation. No plant species of concern would be impacted by construction along this loop route.

Window Rock A and Navajo A Loops. Impacts resulting from the construction of these loops would be the same as described under Section 4.7.1.7.1.

Navajo B Loop. Approximately 494 acres of vegetation would be denuded, of which 296 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant denudation would include approximately 0.2 acre of riparian zone vegetation along intermittent drainages. A portion of this loop was surveyed for Peebles Navajo cactus. No individuals or suitable habitat were encountered along the route. The potential that the species would occur along the portion of the route not surveyed is low. Therefore, the species would not be impacted by the construction of the loop. One federal candidate species could be significantly impacted by construction of the loop,

Table 4.7-16

VEGETATION TYPES AND DENUDED ACREAGES, EL PASO 600 MMcfd ALTERNATIVES

			Denudation 1/ (acres)				
				Native Vegetation 4/			
Geographic Region/ Loop	Vegetation Type	Impact Class 2/	ROW 3/	Short Term	Long Term	Permanent	Total
Colorado Plateau							
Blanco	Pinyon-juniper woodland	III	41.2	56.7	5.2	0	103.1
	Sagebrush Scrub	III	29.6	44.4	0	0	74.0
	Wetland/riparian	II	0	0.2	0	0	0.2
	Subtotal		70.8	101.3	5.2	0	177.3
Window Rock B	Pinyon-juniper woodland	III	76.5	105.1	9.6	0	191.2
	Plains grassland	III	24.2	36.4	0	0	60.6
	Ponderosa pine woodland	II	52.8	72.8	6.6	0	132.2
	Wetland/riparian	II	0.1	0.1	0	0	0.2
	Subtotal		153.6	214.4	16.2	0	384.2
Window Rock A	Pinyon-juniper woodland	III	28.1	38.7	3.5	0	70.3
Navajo B	Plains grassland	III	118.3	177.5	0	0	295.8
	Pinyon-juniper woodland	III	30.6	42.0	3.8	0	76.4
	Sagebrush scrub	III	48.5	72.7	0	0	121.2
	Wetland/riparian	II	0.1	0.1	0	0	0.2
	Subtotal		197.5	292.3	3.8	0	493.6
Navajo A	Plains grassland	III	19.4	29.1	0	0	48.5
	Pinyon-juniper woodland	III	24.2	33.3	3.1	0	60.6
	Subtotal		43.6	62.4	3.1	0	109.1
Leupp	Plains grassland	III	4.4	6.5	0	0	10.9
	Pinyon-juniper woodland	III	9.7	13.3	1.2	0	24.2
	Ponderosa pine woodland	II	86.3	118.7	10.8	0	215.8
	Wetland/riparian	II	0.1	0.1	0	0	0.2
	Subtotal		100.5	138.6	12.0	0	251.1
Williams A	Ponderosa pine woodland	II	33.4	46.0	4.2	0	83.6
	Plains grassland	III	31.0	46.6	0	0	77.6
	Wetland/riparian	III	0.1	0.1	0	0	0.2
	Subtotal		64.5	92.7	4.2	0	161.4
Williams B	Plains grassland	III	9.2	13.9	0	0	23.1
	Ponderosa pine woodland	II	36.4	50.0	4.5	0	90.9
	Pinyon-juniper woodland	III	34.0	46.7	4.2	0	84.9
	Wetland/riparian	II	0	0.1	0	0	0.1
	Subtotal		79.6	110.7	8.7	0	199.0
Seligman	Plains grassland	III	106.7	106.0	0	0	266.7
	Pinyon-juniper woodland	III	38.8	53.2	4.9	0	96.9
	Wetland/riparian	II	0.1	0.1	0	0	0.2
	Subtotal		145.6	213.3	4.9	0	363.8
Mojave Desert							
Hackberry	Mojavean creosote bush scrub	I	126.0	0	0	189.1	315.1
	Wetland/riparian	II	0	0.1	0	0	0.1
	Subtotal		126.0	0.1	0	189.1	315.2

Table 4.7-16 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, EL PASO 600 MMcfd ALTERNATIVES

			Denudation 1/ (acres)				
			Native Vegetation 4/				
Geographic Region/ Loop	Vegetation Type	Impact 2/ Class	ROW 3/	Short Term	Long Term	Permanent	Total
Colorado Plateau							
Laguna (100/500)	ROW	III	35.1	0	0	0	35.1
	Wetland/riparian	II	0.1	0	0	0	0.1
		Subtotal	35.2	0	0	0	35.2
Chaco (200/400)	Sagebrush scrub	III	9.7	14.5	0	0	24.2
	Agricultural land	II	55.8	0	0	0	55.8
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	65.6	14.6	0	0	80.2
White Rock (200/400)	Sagebrush scrub	III	26.2	39.3	0	0	65.5
	Wetland/riparian	II	0.1	0	0	0	0.1
		Subtotal	26.3	39.3	0	0	65.6
Gallup (200/400)	Sagebrush scrub	III	24.7	37.1	0	0	61.8
	Wetland/riparian	II	0	0.1	0	0	0.1
		Subtotal	24.7	37.2	0	0	61.9
Summary Of 100/500 MMcfd Alternative:							
Summary by Vegetation Type							
	Plains grassland	III	313.3	469.9	0	0	783.2
	Pinyon-juniper woodland	III	283.1	389.0	35.5	0	707.6
	Sagebrush scrub	III	78.0	117.0	0	0	195.0
	Ponderosa pine woodland	II	209.0	287.4	26.1	0	522.5
	Mojavean creosote bush scrub	I	126.0	0	0	189.1	315.1
	ROW vegetation	III	35.2	0	0	0	35.2
	Wetland/riparian	II	0.8	1.0	0	0	1.8
		TOTAL	1045.4	1264.3	61.6	189.1	2560.4
Summary by Impact Class 2/							
	Class	I	126.0	0	0	189.1	315.1
	Class	II	209.8	288.4	26.1	0	524.3
	Class	III	709.6	975.9	35.5	0	1721.0
	Class	IV	0	0	0	0	0
		TOTAL	1045.4	1264.3	61.6	189.1	2560.4
Summary Of 200/400 MMcfd Alternative:							
Summary by Vegetation Type							
	Plains grassland	III	313.2	469.9	0	0	783.2
	Pinyon-juniper woodland	III	283.1	389.0	35.5	0	707.6
	Sagebrush scrub	III	138.6	207.9	0	0	346.5

Table 4.7-16 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, EL PASO 600 MMcfd ALTERNATIVES

	Impact Class 2/	Denudation 1/ (acres)				
			Native Vegetation 4/			
		ROW 3/	Short Term	Long Term	Permanent	Total
Summary Of 200/400 MMcfd Alternative (continued):						
Summary by Vegetation Type						
Ponderosa pine woodland	II	209.0	287.4	26.1	0	522.5
Mojavean creosote bush scrub	I	126.0	0	0	189.1	315.1
Agricultural land	II	55.8	0	0	0	55.8
Wetland/riparian	II	1.0	1.2	0	0	2.2
TOTAL		1126.7	1355.4	61.6	189.1	2732.8
Summary by Impact Class 2/						
Class	I	126.0	0	0	189.1	315.1
Class	II	265.8	288.6	26.1	0	580.5
Class	III	734.9	1066.8	35.5	0	1837.2
Class	IV	0	0	0	0	0
TOTAL		1126.7	1355.4	61.6	189.1	2732.8

1/ vegetation loss assuming a 100-foot wide construction ROW, 60 feet within native vegetation and 40 feet within existing ROW vegetation.

2/ see Section 4.2.7.1 for definitions of impact classes.

3/ denudation of existing ROW vegetation assuming a 40-foot wide zone of clearing within the ROW; does not include native vegetation.

4/ native vegetation adjacent to existing ROW, denudation/disturbance 60 feet wide:

short-term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short term within the 60-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

long-term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (45-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; loss would not be significant. This loss would occur only within a 5-foot wide zone adjacent to the existing ROW as part of the 45-foot operational ROW.

permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant. This loss would occur only within the 60-foot wide portion of the 100-foot wide construction ROW within native vegetation.

although field survey for the species would be required to substantiate such an impact.

Leupp Loop. Approximately 250 acres of vegetation would be denuded, of which 150 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant denudation would include 0.2 acre of riparian zone vegetation along intermittent drainages and 15 acres of ponderosa pine woodland. Five federal candidate species may occur in areas traversed by the loop and therefore, could be significantly impacted by construction. Field survey for the species would be required to substantiate such an impact.

Williams A Loop. Approximately 160 acres of vegetation would be denuded, of which 97 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant denudation would include approximately 0.2 acre of riparian zone vegetation along intermittent streams and 50 acres of ponderosa pine woodland. Five federal candidate species may occur in areas traversed by the loop, and therefore could be significantly impacted by construction. Field survey for the species would be required to substantiate such an impact.

Williams B Loop. Approximately 200 acres of vegetation would be denuded, of which 120 acres would consist of native vegetation, the remainder being ROW vegetation. The only significant denudation would include 0.1 acre of riparian zone vegetation along an intermittent drainage and 55 acres of ponderosa pine woodland. Four federal candidate species may occur in areas traversed by the loop, and therefore could be significantly impacted by construction. Field survey for the species would be required to substantiate such an impact.

Seligman Loop. Approximately 364 acres of vegetation would be denuded, of which 218 acres would include native vegetation, the remainder being ROW vegetation. The only significant denudation would include 0.2 acre of riparian zone vegetation along intermittent drainages. Close investigation of habitats that would be traversed by this loop revealed that there is little potential that the Arizona cliffrose would occur along the loop. Therefore, no significant impact would occur to the species as a result of loop construction.

Hackberry Loop. Approximately 315 acres of vegetation would be denuded, of which 190 acres would include native vegetation and the remainder being ROW vegetation. The loss of 190 acres of Mojavean creosote bush scrub would be considered a Class I impact, and the denudation of approximately 0.1 acre of riparian zone vegetation along an intermittent drainage would be a Class II impact. Close investigation of habitats that would be traversed by this loop revealed that there is little potential that Arizona cliffrose would occur along the loop. Therefore, no significant impact would occur to the species as a result of loop construction.

Laguna Loops (100/500 only). All construction would occur within the existing ROW which would result in denudation of 16 acres of vegetation. Approximately 0.1 acre of riparian vegetation along intermittent drainages would be lost. No field surveys were conducted along the route of the loop; however, Zuni fleabane habitat was identified along the existing Transwestern pipeline ROW approximately 0.5 mile north of these loops. This habitat is minimal; however, since the loops would traverse very similar habitat, and since the species exploits disturbed habitats, it is ~~likely~~ possible that the construction could significantly impact the species.

Chaco Loop (200/400 only). Approximately 80 acres of vegetation would be denuded, of which 15 acres would include native vegetation. Approximately 56 acres of agricultural land would be significantly affected. ~~which would be considered significant~~ (Class ~~I~~ II). In addition, approximately 0.2 acre of riparian zone vegetation along an intermittent drainage would be denuded (Class II). Field surveys did not encounter Mancos milkvetch individuals along the proposed loop. Therefore, the species would not be significantly impacted by construction of the loop.

White Rock Loop (200/400 only). Approximately 66 acres of vegetation would be denuded of which 39 acres would consist of native vegetation. The only significant denudation would include 0.1 acre of riparian zone vegetation along intermittent drainages. Field surveys along the route of the loop did not encounter individuals of Mancos milkvetch or Mesa Verde cactus. Therefore, these species would not be significantly impacted by construction of the loop.

Gallup Loop (200/400 only). Approximately 62 acres of vegetation would be denuded, of which 37 would include native vegetation, the remainder being ROW vegetation. The only significant denudation would include approximately 0.1 acre of riparian zone vegetation along intermittent drainages. No plant species of special concern would be impacted by construction of the loop.

Impact Summary. Construction of the El Paso 100/500 Alternative would denude a total of 2,560 acres of vegetation, of which 1,515 acres would be native vegetation adjacent to the existing ROW. The balance, 1,045, would include vegetation within the existing ROW which consists of vegetation resulting from revegetation efforts as well as natural succession by native species from the surrounding areas. Generally, none of the existing ROW has reached a predisturbance condition. Of the 1,515 acres of native vegetation that would be denuded, 190 acres of Class I impact (denudation of Mojavean creosote bush scrub) and 315 acres of Class II impact (denudation of wetland/riparian and ponderosa pine woodland) would result. Construction of this alternative ~~would likely~~ could significantly impact the federally listed threatened species, Zuni fleabane. Several federal candidate species may be significantly impacted by the construction of this alternative although field surveys would be required to substantiate whether or not the several species would occur within the looping ROW.

Construction of the El Paso 200/400 Alternative would denude a total of 2,730 acres of vegetation of which 1,605 acres would be native vegetation adjacent to the existing ROW. The balance, 1,125 acres, would include vegetation within the existing ROW. Of the 1,605 acres of native vegetation that would be denuded, 190 acres of Class I impact (denudation of Mojavean creosote bush scrub) and 316 acres of Class II impact (denudation of wetland/ riparian and ponderosa pine woodland) would result. Construction of this alternative would not impact federally listed plant species. However, several federal candidate species could be significantly impacted (Class II). Field surveys would be required to substantiate whether or not the several species would occur within the looping ROW. Consequently, the 200/400 Alternative would likely denude slightly more wetland/riparian vegetation (Class II impact) than the 100/500 Alternative; however, no impact to federally listed plant species would occur with the implementation of the 200/400 Alternative.

4.7.2.7.2 Wildlife

General impacts associated with the El Paso Expansion Project 600 MMcfd Case alternatives and criteria used to delineate significant impacts are the same as those described in Section 4.2.7.2.

Blanco Loop. No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. Although the entire loop lies within potential habitat for prairie dogs, it is unknown if viable prairie dog colonies currently exist along the loop. If ferrets are present, any construction or operational activities that result in disturbance or loss of individuals would be a Class II impact. Prairie dogs could benefit from the soil disturbance and removal of vegetation, and may occur in higher densities along the ROW after construction. This would be an increase in potential ferret habitat and a Class IV impact. If ferrets became established along the completed route, increased access may result in loss of individuals through crushing by vehicles or shootings. This would be a Class II impact.

Ferruginous and Swainson's hawks potentially nest in the area of concern. Disturbance within 0.5 mile of an active nest site of these species would be a Class II impact. Bald eagles may be subject to potential harassment along portions of the Blanco Loop. Construction effects are expected to be temporary, as long as roosting sites are not directly affected.

Window Rock B Loop. No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Ferruginous hawks and Swainson's hawks~~, and mountain plovers~~ potentially nest in the area of concern. Disturbance within 0.5 mile of an active nest site of these species would be a Class II impact.

Window Rock A Loop. Impacts to wildlife for this loop have been discussed under the Base Case (Section 4.7.1.7.2).

Navajo A Loop. Impacts to wildlife for this loop have been discussed under the Base Case (Section 4.7.1.7.2).

Navajo B Loop. No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Ferruginous and Swainson's hawks potentially nest along the loop. Disturbance within 0.5 mile of an active nest site of these species would be a Class II impact.

Leupp Loop. Two wildlife water guzzlers ~~exist~~ and a spring occurs within 0.5 mile of the loop. If construction activities destroyed these important water sources, it would be a Class II impact. Loss of general wildlife habitat along the extent of this loop would be a Class III impact. Disturbance of 21.8 acres of big game critical winter habitat is a Class II impact.

Species of Special Concern. Ferruginous and Swainson's hawks potentially nest along the loop. Disturbance within 0.5 mile of an active nest site would be a Class II impact.

Williams A Loop. ~~Five~~ Nine water tanks and ~~one~~ two springs exist within one-half mile of the area of concern. If pipeline construction activities destroyed any of these important wildlife water sources, it would be a Class II impact. The loop would cross one timber deferment area which is an old growth forest stand. Because of its limited distribution and the length of time required for replacement, loss of approximately seven acres of this habitat would be a Class I impact. Loss of general wildlife habitat along the extent of this loop would be a Class III impact. Disturbance of 24.2 acres of high value big game habitat is a Class II impact.

Species of Special Concern. Ferruginous and Swainson's hawks potentially nest along the loop. Disturbance within 0.5 mile of an active nest site of these species would be a Class II impact.

Williams B Loop. Ten water tanks are within one-half mile of the loop. No significant impacts to general wildlife would be expected along this loop but the loop traverses 70.3 acres of critical winter range for mule deer and elk. Loss of turkey roosting habitat and loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Ferruginous and Swainson's hawks potentially nest along the loop. Disturbance within 0.5 mile of an active nest of these species would be a Class II impact.

Seligman Loop. No significant impacts to general wildlife would be expected along this loop. Loss of approximately 106 and 112 acres, respectively of high value pronghorn and high value mule deer habitat would be a Class III impact. Loss of general wildlife habitat along the extent of the loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. The loop crosses approximately 6.4 miles of high value prairie dog habitat. If ferrets are present within 0.5 mile of the loop, impacts would be the same as discussed previously under the Blanco Loop.

Ferruginous and Swainson's hawks potentially nest in the area of concern. Disturbance within 0.5 mile of an active nest site of these species would be a significant impact.

Hackberry Loop. No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat would be a Class III impact; however, the entire line crosses potential tortoise habitat, and impacts to habitat are better discussed under species of special concern.

Species of Special Concern. The entire loop crosses potential desert tortoise habitat. At present, no specific populations or tortoise densities are known for the area of concern. Because the majority of populations identified within Arizona have densities between 25-50 tortoise per square mile [Schwable, 1986], it is assumed that the potential densities within the affected area fall within this range. Construction and revegetation activities at any time of year would result in ~~loss of~~ deaths of or injured individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost by falling into the open trench. Utilizing the midpoint figure (37.5 tortoise/mi^{2})for the assumed density range discussed above and a 100-foot ROW, approximately 18 tortoise would be potentially lost through construction activities. Although detailed mitigation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the creosote bush scrub community, loss of approximately 190 acres of suitable habitat would be a Class I impact.

The Gila monster is a rare species throughout its range, and loss of individuals through crushing by heavy equipment or entrapment in open trenches would be a Class I impact.

Laguna Loop (100/500 only). No significant impacts to general wildlife would occur along this loop. Loss of general wildlife habitat along the extent of the loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. Approximately one mile of this loop crosses suitable prairie dog habitat. If ferrets are present within 0.5 mile of the loop, impacts would be the same as discussed above for the Blanco Loop.

Ferruginous and Swainson's hawks potentially nest in the area of concern. Disturbance within 0.5 mile of an active nest site of these species would be a Class II impact.

Chaco Loop (200/400 only). No significant impacts to general wildlife would occur along this loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. The entire loop crosses potential prairie dog habitat. If ferrets are present within 0.5 mile of the loop, impacts would be the same as discussed previously for the Blanco Loop.

Ferruginous hawks, Swainson's hawks and mountain plovers potentially nest in the area of concern. Disturbance within 0.5 mile of an active raptor nest site would be a Class II impact.

White Rock Loop (200/400 only). No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat along the extent of the loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. The entire loop crosses potential prairie dog habitat. If ferrets are present within 0.5 mile of the loop, impacts would be the same as previously discussed under the Blanco Loop.

Ferruginous hawks, Swainson's hawks and mountain plovers potentially nest in the area of concern. Disturbance within 0.5 mile of an active raptor nest site would be a Class II impact.

Gallup Loop (200/400 only). No significant impacts to general wildlife would be expected along this loop. Loss of general wildlife habitat along the extent of the loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. The entire loop crosses potential prairie dog habitat. If ferrets are present within 0.5 mile of the loop, impacts would be the same as discussed under the Blanco Loop. Ferruginous hawks, Swainson's hawks and mountain plovers potentially nest in the area of concern. Disturbance within 0.5 mile of an active raptor nest site would be a Class II impact.

Summary of Significant Impacts. Construction of the 100/500 El Paso Alternative would potentially disturb two wildlife guzzlers, ~~five~~ nineteen water tanks and ~~one~~ three natural springs. This would be a Class II impact. Loss of seven acres of a wildlife timber deferment area would be a Class I impact. Species of special concern potentially impacted along this alternative include the black-footed ferret, Swainson's hawk, ferruginous hawk, mountain plover, Gila monster and desert tortoise. Potential prairie dog habitat (suitable ferret habitat) occurs along approximately 22 miles of this alternative. If ferrets are present, construction activities would be a Class II impact. Potential mountain plover nesting habitat occurs along approximately 38 miles of this alternative. Ferruginous and Swainson's hawks may nest along the entire alternative, except the Hackberry Loop; this is a total of approximately 185 miles. Disturbance of active nests would be a Class II impact. Approximately 26 miles of potential Gila monster habitat is crossed by the alternative. Loss of individuals is a Class I impact. Twenty-six miles of suitable tortoise habitat is crossed by the proposed alternative. The potential loss of tortoises and 190 acres of habitat would be Class I impacts.

Two of the most significant long-term impacts that a developed pipeline ROW has on wildlife populations are 1) increased forage/edge in forest and woodland habitats (a Class IV impact), and 2) increased human access (a Class II or III impact). Increased forage/edge is a favorable impact, but increasing public access reduces habitat use by wildlife. If roads are improved along the loop as a result of construction, the impact on wildlife will be negative. However, it is unlikely that new access or significant improvement of existing access would occur.

Construction of the 200/400 El Paso Alternative would significantly impact the same species and habitats described for the 100/500 Alternative. However, some quantities differ under this scenario. Potential prairie dog habitat (suitable ferret habitat) occurs along approximately 39 miles of this alternative. Potential ferruginous and Swainson's nesting habitat is crossed by approximately 199 miles of this alternative. Potential mountain plover nesting habitat is crossed by about 55 miles of this alternative.

4.7.2.7.3 Grazing

Criteria used to evaluate potential impacts to grazing along the route of the El Paso 600 MMcfd alternatives are the same as those listed in Section 4.2.7.3.

No significant impacts to grazing would occur since less than one percent of each allotment would be affected (see Appendix D) and basic assumptions involving the maintenance of control and separation, revegetation, access, and the time allowed for the trench to remain open, would be followed (Section 4.2.7.3).

4.7.2.8 Socioeconomics

Significance criteria have been presented in Section 4.2.8.

4.7.2.8.1 Population, Housing, and Economic Impacts

100/500 Alternative

The 100/500 Alternative involves construction in Cibola and San Juan Counties in New Mexico and Apache, Navajo, Coconino, Mohave and Yavapai Counties in Arizona. The expansion of existing facilities and the increase of horsepower at existing compressor stations will be required. An additional 3,580 hp of compression will be installed at the Bondad Station in La Plata County, Colorado, and 5,300 hp of compression at the Hackberry B Compressor Station in Mohave County, Arizona.

Rewheel and other modifications will be undertaken at the Dilkon Compressor Station, Seligman A Compressor Station, Topock Station, Wenden Station, Gila Station, and Valve City.

In the case of the 100/500 Alternative, eleven loops will be added to the existing pipeline as follows:

Blanco Loop, San Juan County, NM - 14.6 miles
Laguna Loop, Cibola County, NM - 3.2 miles
Window Rock Loops A & B, Apache County, AZ - 37.5 miles
Navajo Loops A & B, Navajo County, AZ - 49.6 miles
Leupp Loop, Coconino County, AZ - 20.7 miles
Williams Loops A & B, Coconino County, AZ - 29.7 miles
Seligman Loop, Yavapai County - 30.0 miles
Hackberry Loop, Mohave County, AZ - 24.5 miles

The estimated aggregate socioeconomic impacts of the 100/500 Alternative are presented in Table 4.7-4. Very little information was available on the construction spreads or other facets of the construction or operation activities. However, information was available on looping from the Transwestern Proposal and on compressor construction in the Mojave Proposal. Pipeline looping construction activities were assumed to be similar to Transwestern Spread No. 2. This spread was chosen because it most closely approximated the mileage to be constructed in the El Paso Proposal. The adjustment of the Transwestern data to this project was based on a change in construction duration. This change was based on the relative miles of pipeline to be looped.

The construction at the Bondad Compressor Station and the Hackberry B Compressor Station was assumed to be similar to construction of the Topock Compressor Station in the Mojave Proposal. Rewheel activities are assumed to require the same workforce as a compressor installation. However, the duration of construction was assumed to be less. A rewheeling costs approximately $272,000 while the construction cost of the Bondad Compressor is $5,669,000 [El Paso Natural Gas Company, 1985]. The ratio of four rewheels to one compressor was used to determine the construction duration for the rewheeling activities. Little was known about the required employment and construction methods to install four additional 16" O.D. meter runs and modify three existing 16" O.D. meter runs at the Topock Station. Therefore, this activity was assumed to be similar to a rewheeling. Facility modification at the Wenden Station, Gila Station, and Valve City were not included in the estimates because no information was available as to construction methods and the available description indicated only one 20" valve was being installed at each site.

In general, the economic impacts in terms of employment and income will not be significant. Local tax revenues generated by the El Paso project are primarily insignificant as a result of the fact that the increases in assessed valuation attributable to looping and rewheel activities are small. Demands for housing exceed supply in several cases. In Apache County, Arizona, the demand for motel rooms exceeds supply by a factor of two. In addition, the demand for RV spaces will not be met due to a complete absence of supply. Workcamps or longer commuting distances will be required to ameliorate these shortfalls. Demands for rental units exceed supply in Navajo County, Arizona. It is likely in both of these cases that construction workers will shift their demand from rental units to motel accommodations in that a good supply of the latter accommodations exist in the county. Alternatively, excess demand for rental units will shift to areas outside the cities of Holbrook and Winslow.

As shown in Table 4.7-4, construction crews will total 700 workers for the New Mexico and Arizona loops. An additional 145 workers will be required for rewheel activities in New Mexico and Arizona and 145 workers each for the Bondad Compressor Station in La Plata County, Colorado, and the Hackberry Compressor Station in Mohave County, Arizona. Based on Transwestern Proposal data, construction crews will be comprised of 65 percent nonlocal workers and 35 percent local resident workers. As discussed for the Mojave Proposal, generally local workers are of the lesser skill types while skilled labor is usually brought in. Other miscellaneous personnel required for construction will be 54 nonlocal personnel for the pipeline loops and 33 for the compressor station and rewheel activities. Total nonlocal personnel required will equal 825, while local construction personnel will equal 250. No operation personnel are proposed for the expansion.

Population changes resulting from the 100/500 Alternative are expected to be minimal and of short duration (i.e. a maximum of 5.2 months or 157 days). Table 4.7-4 indicates that inmigrant population will equal 1,075. This estimate includes .3 dependents per worker on each spread and construction site based on a 1979 survey of pipeline construction workers. Population changes by county will be insignificant and less than one percent of the existing population in any of the affected counties. Overall, since the population influx will be of a temporary nature and will be less than one percent, no significant impact based on significance criteria will result from the 100/500 Alternative.

Estimates provided for the Transwestern Spread Number 2 indicate that total expenditures per day for each nonlocal worker are $68.50. Based on the number of nonlocal workers for the expansion and their duration of employment, the total expenditures by nonlocal construction personnel for the duration of the project will be $10.3 million. These expenditures will primarily be for temporary lodging, restaurants, and retail purchases. Total expenditures for local construction personnel will equal $10.5 million (Table 4.7-4) based on a take-home pay of $14.56 per hour and a ten-hour workday. Additional local purchases of $2.6 million by contractors of local miscellaneous goods and services are expected based on cost data for the El Paso expansion.

The influx of pipeline personnel and family members, as well as the purchases by local residents and contractors in local areas, will result in temporary increases in retail sales, as well as increased tax revenues. However, the major sources of increased local tax revenues will result from increased property taxes on the new assessed value of the pipeline loops and facilities in each county. These amounts are presented in Table 4.7-6 where the total assessed value of each county and the pipeline's percent contribution to the total assessed value in the county are presented. The increases for the 100/500 Alternative do not exceed six percent of the existing assessed value in any affected county.

Estimates of housing demand by nonlocal workers are based on information provided for the Transwestern Project as follows: Hotels/Motels - 43 percent, Rental Units - 28 percent, R/V Campers - 27 percent, and Other - 2 percent. Table 4.7-5 presents the anticipated distribution of the housing demand by city. This distribution of demand is based on available supply and distance to the construction site as was discussed for the Mojave Project. As shown in Table 4.7-5, the demand for temporary housing will not be met by existing supplies in Winslow, Holbrook, and Apache County in Arizona. The result will be most likely a spillover of the demand for rental units in Holbrook and Winslow to motel accommodations and the need of workers in Apache County to seek RV spaces and hotels in more distant locations or set up workcamps.

200/400 Alternative

The 200/400 Alternative includes all loops in the 100/500 Alternative but the Laguna Loop in Cibola County. The 200/400 Alternative will involve three additional loops: the Chaco Loop, in San Juan County, New Mexico; the White Rock Loop, in San Juan County, New Mexico; and the Gallup Loop, in McKinley County, New Mexico. The additional construction activity associated with these loops will add to the socioeconomic impact of the project. The augmentation, in terms of aggregate socioeconomic impacts, is shown in Table 4.7-4. The impacts were calculated assuming one spread will construct all three loops. The spread would be comprised of a total of 377 employees who would work 37 days.

Of the employees, 255 would migrate into the area bringing 77 dependents with them. The types of housing or accommodations these individuals and families would demand are shown in Table 4.7-5. While construction was occurring at the Blanco Loop, most of the demand for housing of all types would be met in Farmington, approximately 15 miles away. Farmington has 1,200 motel and hotel rooms and 61 available R/V spaces. In addition, 355 other R/V spaces are available in San Juan County near the ROW.

During construction at the White Rock Loop, demand for housing would be split between Farmington and Gallup. When construction shifted to the Gallup Loop, most of the demand for accommodations would shift to Gallup. Gallup has 1,600 motel and hotel rooms and 311 R/V spaces available.

In addition to the public finance impacts discussed above for the 100/500 Alternative, the 200/400 Alternative would contribute additional amounts to the tax bases of San Juan and McKinley Counties. Based on a construction cost of approximately $512,000 per mile [El Paso Natural Gas Company, November 1985], San Juan County's tax base will increase by $6.1 million, and McKinley County's tax base will increase by $2.7 million. The current total county assessed value is $1.5 billion in San Juan County and $451 million in McKinley County.

4.7.2.8.2 Traffic

No traffic related impacts are anticipated for any of the loops since roads in these sparsely populated areas have very light traffic.

4.7.2.8.3 Noise

Noise levels associated with construction activities were addressed in Section 4.2.8.3. Since the 600 MMcfd Alternatives would traverse more urban areas at Grants, New Mexico, and Flagstaff, Arizona, noise levels would be higher than in the loop areas in more rural settings. Increased noise levels associated with construction, however, would be short term, generally during daylight hours lasting fewer than 10 working days at any particular point along the loops. Since the loops are generally situated in rural areas, the impacts from noise caused by construction activities would not be considered significant.

Modifications to the compressor stations for the 600 MMcfd Alternatives should have no effects on noise levels. The addition of either one or two 3580 hp compressors at the Bondad Station in La Plata County, Colorado, should not cause significant increases to the ambient noise levels in the area. The nearest noise receptors to the Bondad Station are to the north at a distance of less than 0.5 mile. Increases in the noise level are not expected to increase by more than 4 dBA.

The addition of a 5300 hp compressor unit at the Hackberry B Station in Yavapai County, Arizona, should not cause significant increases to the ambient noise levels in the area. The nearest noise receptors are located over two miles away. Increases to the noise levels are not expected to increase by more than 4 dBA.

~~Since the applicant has not specified the type of natural gas compressors that it plans to use, it is difficult to determine if the equipment eventually installed would cause significant impacts to the noise levels.~~ In its application, El Paso has stated that turbine-driven centrifugal compressor units would be installed at both the Bondad and Hackberry compressor stations. Compressor station design criteria should include suppression equipment to meet the noise limits in effect at the time the compressors were purchased in conformance with EPA guidelines.

4.7.2.8.4 Recreational Resources

100/500 Alternative

Blanco, Window Rock B and A, Navajo B and A, Leupp, Williams A and B, Seligman, Hackberry Loops. No impacts on the dispersed recreational activities are expected to occur.

Laguna Loop. The baseball field on the New Mexico State University campus will be adversely impacted on a short-term basis during construction (MP 333.79-334.50). The go-cart track between MP 337.50-337.78 will also be affected on a short-term basis.

200/400 Alternative

No impacts on the dispersed recreational activities are expected to occur on any of the loops.

4.7.2.9 Land Ownership/Use

El Paso's 600 MMcfd alternatives land use impacts will be assessed according to the degree of conflict between the routing and existing land uses or policies regarding land use.

Table 4.7-17 shows the number of acres that would be disturbed by each loop by land ownership category. Table 4.7-18 shows the number of acres that would be disturbed by land use category.

Blanco, White Rock, Gallup, Window Rock A, Navajo B and A, and Laguna Loops have no identified land use conflicts.

The Chaco Loop traverses irrigated cropland used to grow annual grain crops. The pipeline construction and operation is not expected to disturb the productivity over one growing season; therefore, the impact is short term.

The Window Rock B and Leupp Loops, Williams A and B Loops would remove land from commercial timbering use for the life of the project. This is a long-term impact.

The Leupp Loop would also pass through the Elden Environmental Study Area; this is not in conformance with the Coconino FS Resource Management Plan, and would constitute a significant impact.

The Hackberry Loop is zoned residential. Consultation with Mohave County planners will be necessary, but no significant impact is anticipated since there currently are no residences within 100' feet of the proposed route.

New Mexico State University officials would have to be consulted before construction of the second Laguna Loop.

4.7.2.10 Cultural Resources

4.7.2.10.1 Archaeology

100/500 Alternative

Blanco Loop. Four known sites fall within the direct impact zone, a ceramic-lithic scatter, an Anasazi roomblock with associated artifacts, a site with a hearth and groundstone of unknown time period, and an historic trash scatter. No surveys to BLM standards have been conducted in the direct impact zone.

Table 4.7-17

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, EL PASO 600 MMcfd ALTERNATIVES

Alternative Loop	County, State	Area of Disturbance	Total Acres	Private Acres	BLM Acres	State Acres	Indian Acres	FS Acres
Blanco	San Juan, NM	60' Construction/Operation	106.2	10.9	88.0	7.3	-	-
Chaco (200/400)	San Juan, NM	60' Construction/Operation	47.3	13.1	-	-	34.2	-
White Rock (200/400)	San Juan, NM	60' Construction/Operation	39.3	-	-	-	39.3	-
Gallup (200/400)	McKinley, NM	60' Construction/Operation	37.8	-	-	-	37.8	-
Window Rock B	McKinley, NM	60' Construction/Operation	101.8	29.1	-	-	72.7	-
	Apache, AZ	60' Construction/Operation	128.7	-	-	-	128.7	-
Subtotal			230.5	29.1	-	-	201.5	-
Window Rock A	Apache, AZ	60' Construction/Operation	42.2	-	-	-	42.2	-
Navajo B	Navajo, AZ	60' Construction/Operation	296.0	58.2	-	-	237.8	-
Navajo A	Navajo, AZ	60' Construction/Operation	65.5	29.1	-	-	36.4	-
Leupp	Coconino, AZ	60' Construction/Operation	150.5	40.0	-	18.2	-	92.4
Williams A	Coconino, AZ	60' Construction/Operation	96.7	17.5	-	-	-	79.3
Williams B	Coconino, AZ	60' Construction/Operation	7.3	-	-	-	-	7.3
	Yavapai, AZ	60' Construction/Operation	112.0	7.3	-	-	-	104.7
Subtotal			119.3	7.3	-	-	-	112.0
Seligman	Yavapai, AZ	60' Construction/Operation	218.2	109.1	-	109.1	-	-
Hackberry	Mohave, AZ	60' Construction/Operation	189.1	72.7	98.2	18.2	-	-
Laguna (100/500)	Cibola, NM	60' Construction/Operation	22.5	19.6	-	-	-	2.9
100/500 TOTAL			1536.7	393.5	186.2	152.7	517.8	286.5
200/400 TOTAL			1638.5	386.9	186.2	152.7	629.1	283.6

( ) Percentages within county
[ ] Total percentages within loop or line

BLM = Bureau of Land Management FS = Forest Service

Table 4.7-18

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE, EL PASO 600 MMcfd ALTERNATIVES

Alternative Loop	County, State	Acres of Disturbance	Total Acres	Grazing/ Rangeland Acres	Timber/ Forest-land Acres	Irrigated Non-Irrigated Agriculture Acres	Residential Acres	Commercial Acres	Other Acres
Blanco	San Juan, NM	60' Construction/Operation	106.2	106.2	-	-	-	-	-
Chaco (200/400)	San Juan, NM	60' Construction/Operation	47.3	-	-	47.3	-	-	-
White Rock (200/400)	San Juan, NM	60' Construction/Operation	39.3	39.3	-	-	-	-	-
Gallup (200/400)	McKinley, NM	60' Construction/Operation	37.8	37.8	-	-	-	-	-
Window Rock B	McKinley, NM	60' Construction/Operation	101.8	101.8	-	-	-	-	-
	Apache, AZ		128.7	56.0	72.7	-	-	-	-
Subtotal			230.5	157.8	72.7	-	-	-	-
Window Rock A	Apache, AZ	60' Construction/Operation	42.4	42.2	-	-	-	-	-
Navajo B	Navajo, AZ	60' Construction/Operation	296.0	296.0	-	-	-	-	-
Navajo A	Navajo, AZ	60' Construction/Operation	65.5	65.5	-	-	-	-	-
Leupp	Coconino, AZ	60' Construction/Operation	150.5	29.0	77.8	-	29.1	-	14.5 1/
Williams A	Coconino, AZ	60' Construction/Operation	96.7	-	96.7	-	-	-	-
Williams B	Coconino,AZ	60' Construction/Operation	7.3	-	7.3	-	-	-	-
	Yavapai,AZ		112.0	7.3	104.7	-	-	-	-
Subtotal			119.3	7.3	112.0	-	-	-	-
Seligman	Yavapai, AZ	60' Construction/Operation	218.2	214.5	-	-	-	3.6	-
Hackberry	Mohave, AZ	60' Construction/Operation	189.1	116.4	-	-	72.7	-	-
Laguna	Cibola, NM	60' Construction/Operation	22.5	11.6	-	-	8.7	2.2	-
100/500 TOTAL			1536.7	1046.5	359.3		110.5	5.8	14.5 1/
200/400 TOTAL			1638.5	1112.0	359.3	47.3	101.8	3.6	14.5 1/

1/ ESA (Environmental Study Area)
( ) Percentanges within county
[ ] Total percentages within loop or line

Two sites fall within the indirect impact zone: an Anasazi roomblock with associated lithic-ceramic scatter and an historic Navajo corral.

Laguna Loop. One known site falls within the zone of direct impact, a lithic scatter. No surveys to BLM standards have been conducted in the direct impact zone.

One site falls within the zone of indirect impact, a lithic scatter.

Window Rock B Loop. Two known sites fall within the zone of direct impact. Both are historic Navajo sites with fire altered rock. Only 15.8 percent of the direct impact zone has been surveyed.

Eight sites fall within the zone of indirect impact: an Anasazi roomblock and an Anasazi mound with associated artifact scatter, and six historic Navajo sites. The latter include an oven with an historic dump and three hogan sites (one with a sweathouse and one with a corral).

Window Rock A Loop. There are no known sites for this loop. No surveys to BLM standards have been conducted.

Navajo B Loop. Nineteen known sites fall within the zone of direct impact: three ceramic scatters, six lithic-ceramic scatters, and ten prehistoric structures with associated artifact scatter. No surveys have been conducted to BLM standards within the direct impact zone.

Nine sites fall within the zone of indirect impact: two lithic scatters, a lithic-ceramic scatter, four prehistoric structures with associated artifact scatter, a prehistoric site of unknown type, and an historic Navajo structure.

Navajo A Loop. One known site falls within the zone of direct impact, a ceramic scatter. No surveys have been conducted to BLM standards within the direct impact zone.

Two known sites fall within the zone of ~~direct~~ indirect impact: a ceramic scatter and an historic Navajo structure.

Leupp Loop. Sixteen known sites fall within the direct impact zone. The fifteen prehistoric sites are primarily Sinaguan and include six roomblocks, three fieldhouses, two pithouse sites, a ceramic scatter, a lithic-ceramic scatter, a cave, and a site of unknown type. The historic site is an Anglo habitation structure. About 26.1 percent of the direct impact zone has been surveyed.

Forty-five sites fall within the zone of indirect impact. The prehistoric sites are primarily Sinaguan and include eleven pithouse sites, seven roomblocks, five fieldhouses, twelve ceramic scatters, and one lithic-ceramic scatter. Other prehistoric sites include a rock alignment, a trail, and two caves with associated roomblocks. The three historic (Anglo) sites consist of two habitation structures and a burial. Finally, there is one site of unknown type and time period.

Williams A Loop. One known site falls within the zone of direct impact: a lithic scatter. About 33.5 percent of the direct impact zone has been surveyed.

Three sites fall within the indirect impact zone: a Cohonina fieldhouse and two rockshelter sites.

Williams B Loop. One known site falls within the zone of direct impact: a lithic-ceramic scatter. About 29.0 percent of the direct impact zone has been surveyed.

~~Five~~ Six sites fall within the zone of indirect impact: two lithic-ceramic scatters, a stone circle, and associated lithics, and two historic Anglo sites.

Seligman Loop. No known sites fall within the zones of direct or indirect impact. No surveys have been conducted to BLM standards.

Hackberry Loop. ~~One~~ No known sites fall within the zone of direct impact.~~: Needles Bridge which has been nominated to the National Register.~~ Only 3.5 percent of the direct impact zone has been surveyed.

One know site falls within the zone of indirect impact, a lithic scatter.

All Loops. A total of ~~46~~ 45 sites fall within the zone of direct impact and ~~75~~ 76 sites fall within the zone of indirect impact. ~~Needles Bridge, which falls within the direct impact zone, has been nominated to the National Register.~~ Note, however, that only 9.7 percent of the direct impact zone has been surveyed to BLM standards. The entire route was surveyed by Wendorf et al., [1956] but not to current BLM standards.

There are four high sensitivity pipeline segments along the Window Rock B, Navajo B (2), and Leupp Loops.

200/400 Alternative

Chaco Loop. Seven known sites fall within the zone of direct impact: four lithic scatters, an Archaic lithic-groundstone scatter, a hearth site with lithics, and an historic Navajo corral with groundstone and lithics. The entire direct impact zone appears to have been surveyed.

Six sites fall within the zone of indirect impact: two lithic scatters, three historic Navajo habitation sites with corrals, hogans and trash, and a site of unknown type and time period.

White Rock Loop. There are no known sites within the zone of direct impact. About 92.6 percent of the direct impact zone appears to have been surveyed.

Two sites fall within the zone of indirect impact: an Anasazi roomblock with associated artifacts and a rock alignment of unknown time period.

Gallup Loop. Two known sites fall within the zone of direct impact. They are both Anasazi ceramic scatters. About 38.4 percent of the direct impact zone has been surveyed.

Four sites fall within the zone of indirect impact. They are all Anasazi and include a pithouse site with associated cistern and ceramics, a depression associated with a lithic-ceramic scatter, a rock alignment with ceramics, and a ceramic scatter.

All Loops. A total of ~~54~~ 53 known sites fall within the zone of direct impact and ~~86~~ 87 sites fall within the zone of indirect impact. ~~Needles Bridge, which falls within the zone of direct impact, has been nominated to the National Register.~~ Note, however, that only 15.2 percent of the direct impact zone has been surveyed to BLM standards. The entire route was surveyed by Wendorf et at., [1956] but not to current BLM standards.

There are five high sensitivity pipeline segments along the Window Rock B, Navajo B (2), Leupp, and Gallup Loops.

4.7.2.10.2 American Indian Concerns

The Chaco, White Rock, Gallup, Window Rock A and B, and Navajo A and B expansion loops cross important sections of the Navajo Indian Reservation. Concerns about impacts are the same as those presented in Section 4.7.1.10.2 above.

The Hopi Indian Tribe is concerned about the possibility that blasting during construction of parts of the Navajo B Loop may scare away Golden Eagles from their sacred nesting places east and northeast of Dilkon. The loops will not impact Hopi tribal lands.

The Pueblo of Zuni was particularly concerned about any impacts to burial sites.

The project, including the expansion of the Bondad Compressor Station, will not impact any lands belonging to the Southern Ute Indians.

4.7.2.11 Paleontological Resources

No known fossil localities occur within the corridor of the El Paso 600 MMcfd Alternative loops. Table 4.7-19 lists the impact mileages broken down by significance criteria and loop segment. A detailed discussion on paleontologic resources occurs in the Paleontological Resource Assessment Technical Report [Morales et al., 1987].

Table 4.7-19

PALEONTOLOGICAL FORMATION IMPACT MILEAGES, EL PASO 600 MMcfd ALTERNATIVES

Loop	Total Route Miles	Impact Mileages: Undetermined	Impact Mileages: Insignificant	Impact Mileages: Significant
Laguna (100/500 Only)	3.1	0.0	2.3	0.8
Blanco	14.6	0.0	6.3	8.3
Window Rock A	5.8	0.0	0.0	5.8
Window Rock B	31.7	0.0	3.9	27.8
Navajo A	9.0	0.0	0.8	8.2
Navajo B	40.7	0.0	2.8	37.9
Leupp	20.7	0.0	12.0	8.7
Williams A	13.3	0.0	13.3	0.0
Williams B	16.4	0.0	16.4	0.0
Seligman	30.0	0.0	27.8	2.2
Hackberry	26.0	0.0	26.0	0.0
Chaco (200/400 only)	6.5	0.0	0.8	5.7
White Rock (200/400 only)	5.4	0.0	0.4	5.0
Gallup (200/400 only)	5.2	0.0	0.0	5.2

4.7.2.12 Visual Resources

Table 4.7-20 summarizes the impacts for the 600 MMcfd Alternatives. Refer to Section 4.2.12 for impact methodology.

Blanco Loop

MP 7.9-9.9, VRM/VQO: BLM Class III
Description: The Blanco Loop would create a low visual impact because of existing modifications. Portions of the pipeline would be visible from Highway 550 (both north and south-bound

Table 4.7-20

SUMMARY OF VISUAL IMPACTS, EL PASO 600 MMcfd ALTERNATIVES

						Visual Impacts (Miles)			
Milepost	Loop	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	High 1/	Moderate 1/	Low	None
0.0-7.7	Blanco	BLM/Farmington	Colorado Plateau	IV	Highway 550/ S.R. 173	-	-	-	x
7.7-9.7	Blanco	BLM/Farmington	Colorado Plateau	III	Highway 550/SR 173	-	-	2.0	
9.7-14.6	Blanco	BLM/Farmington	Colorado Plateau	IV	Highway 550/ S.R. 173	-	-	-	x
12.85-19.35	Chaco	BLM/Farmington	Colorado Plateau	IV	Seldom Seen	-	-	-	x
43.6-49.0	White Rock	~~BLM/Farmington~~ Indian Res.	Colorado Plateau	IV	Seldom Seen	-	-	-	x
65.1-70.2	Gallup	BLM/Farmington	Colorado Plateau	IV	Highway 666	-	-	-	x
85.3-117.0	Window Rock B	Indian Res.		NA		-	-	-	x
118.7-124.5	Window Rock A	Indian Res.		NA		-	-	-	x
152.4-193.1	Navajo A & B	Indian Res.		NA		-	-	-	x
229.6-232.0	Leupp	State/Private		NA		-	-	-	x
232.0-233.0	Leupp	FS	Coconino NF	M		-	-	-	x
233.7-235.9	Leupp	FS	Coconino NF	R		-	2.2	-	
235.9-239.9	Leupp	FS	Coconino NF	M		-	-	-	x
239.9-246.1	Leupp	FS	Coconino NF	R		-	6.2	-	
246.1-250.3	Leupp	FS	Coconino NF	M		-	-	-	x
263.6-265.7	Williams A	FS	Coconino NF	PR	Highway 40	-	-	2.1	
265.7-266.7	Williams A	FS	Coconino NF	M	Seldom Seen	-	-	-	x
266.7-268.5	Williams A	FS	Coconino NF	PR	Seldom Seen	-	-	1.8	
268.5-269.5	Williams A	FS	Kaibab NF	PR	Forest Rt.141	-	-	1.0	
269.5-276.5	Williams A	FS	Kaibab NF	M		-	-	-	x
276.5-276.9	Williams A	FS	Kaibab NF	PR	Forest Rt.74	-	-	0.4	
283.4-284.0	Williams B	Williams,AZ	Community	NA	Williams,AZ	-	-	-	x
284.0-287.2	Williams B	FS	Kaibab NF	M		-	-	-	x
287.2-288.2	Williams B	FS	Kaibab N	PR	Forest Rt.124	-	-	1.0	
			TOTAL (Miles) OF VISUAL IMPACT			0.0	8.4	8.3	

1/ Significant impacts

traffic) and State Route 173 (both east and west-bound traffic). Slow vegetative rejuvenation would result in a long-term vegetation recovery rate. These impacts are insignificant (Figure 4.7-1).

Leupp Loop

MP 233.7-235.9, VRM/VQO: FS Class R
Description: This segment of the route in the Coconino National Forest would create a moderate visual impact because of existing modifications. The pipeline ~~and the proposed expansion loop~~ would be visible to north and south-bound motorists on Forest Route 505 and recreational users of the National Forest. Slow revegetative rejuvenation would result in a long-term recovery rate. These impacts are significant (Figure 4.7-2).

MP 239.9-246.1, VRM/VQO: FS Class R
Description: This segment of the route in the Coconino National Forest would create a moderate visual impact because of existing modifications. The pipeline ~~and the proposed expansion loop~~ would be visible to east and west-bound motorists on Forest Route 510 and recreational users of the National Forest. Slow vegetative rejuvenation would result in a long-term recovery rate. These impacts are significant (Figure 4.7-2).

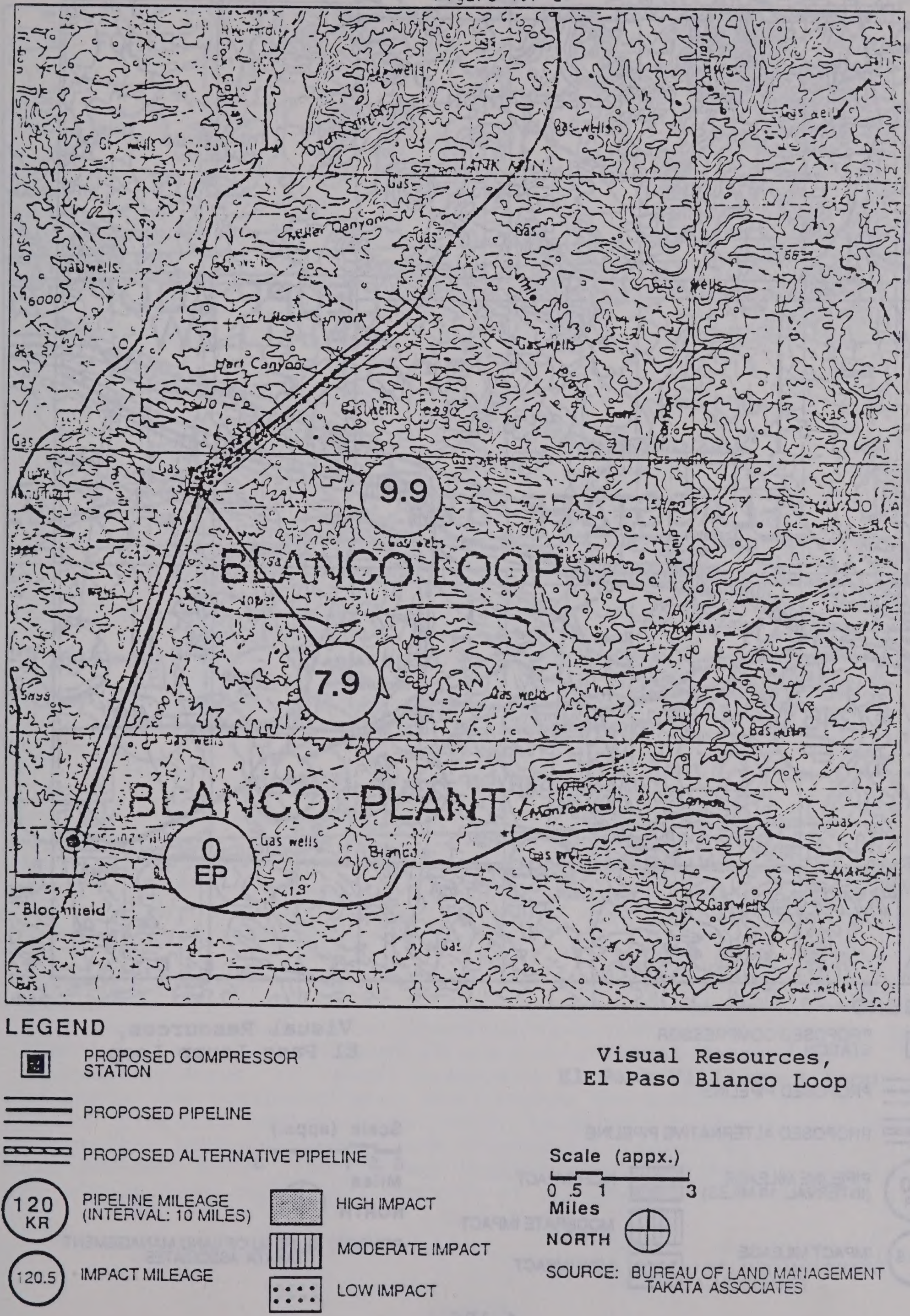
Williams A Loop

MP 263.6-265.7, VRM/VQO: FS Class PR,
MP 266.7-268.5, VRM/VQO: FS Class PR
Description: These segments of the route in the Coconino National Forest would create a low visual impact because of existing modifications. The pipeline would be visible to east and west-bound motorists on Interstate 40 and from recreational users of the forest. Slow forest rejuvenation would result in a long-term recovery rate. These impacts are not significant (Figure 4.7-3).

MP 268.5-269.5, VRM/VQO: FS Class PR
Description: This segment of the route in the Kaibab National Forest would create a low visual impact because of existing modifications. The pipeline would be visible to east and west-bound motorists on Interstate 40 and Forest Route 141, and from recreational users of the forest. Slow forest rejuvenation would create a long-term recovery rate. These impacts are not significant (Figure 4.7-3).

MP 276.5-276.9, VRM/VQO: FS Class PR
Description: This segment of the route in the Kaibab National Forest would create a low visual impact because of existing modifications. The pipeline would be visible to east and west-bound motorists on Interstate 40 and Forest Route 74, and from recreational users of the forest. Slow forest rejuvenation would

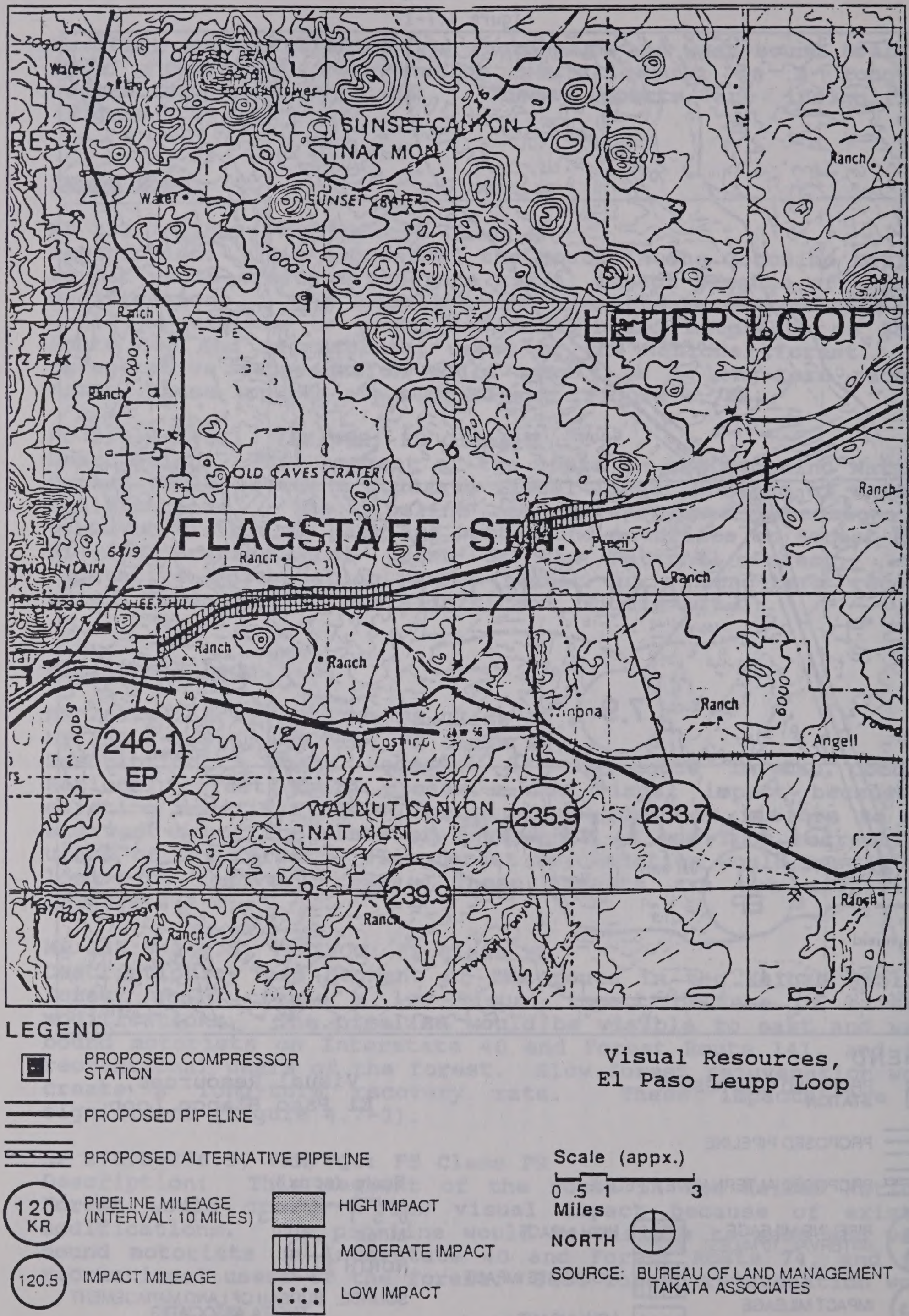
Figure 4.7-1


Gas wells
TANK MTN
Gas
Keller Canyon
Gas wells
6000
Ash Rock Canyon
Hart Canyon
Gas wells
9.9
BLANCO LOOP
7.9
Gas wells
BLANCO PLANT
Montoya
0
EP
Gas wells
Blanco
Bloomfield
Gas wells
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH

Visual Resources,
El Paso Blanco Loop

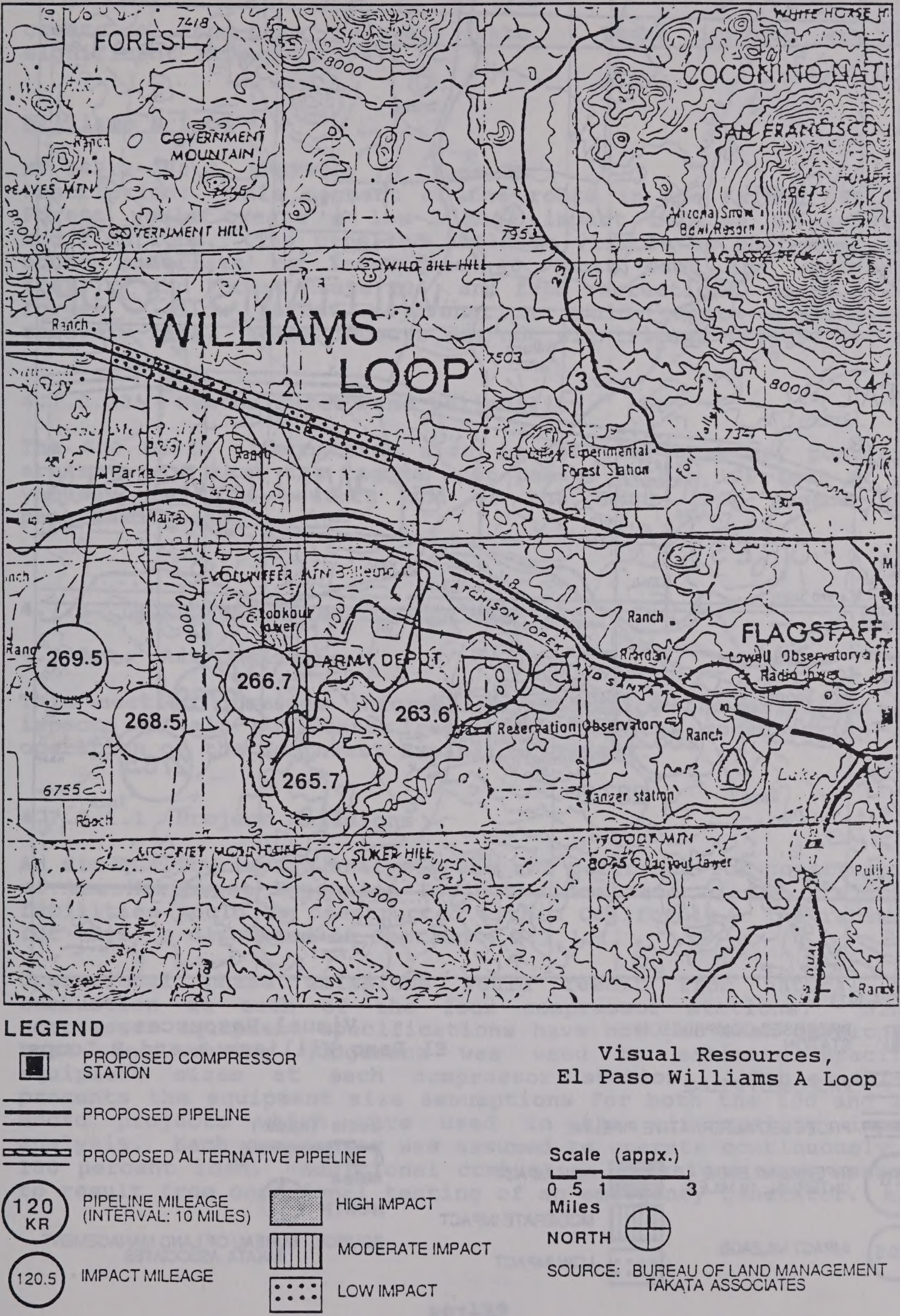
SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.7-2


SUNSET CANYON NAT MON
SUNSET CRATER
Water
Ranch
LEUPP LOOP
OLD CAVES CRATER
FLAGSTAFF STA.
SHEEP HILL
6819
7000
6000
Winona
Cosnino
Angell
WALNUT CANYON NAT MON
Walnut Canyon
246.1 EP
235.9
233.7
239.9
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH
SOURCE: BUREAU OF LAND MANAGEMENT TAKATA ASSOCIATES

Visual Resources,
El Paso Leupp Loop

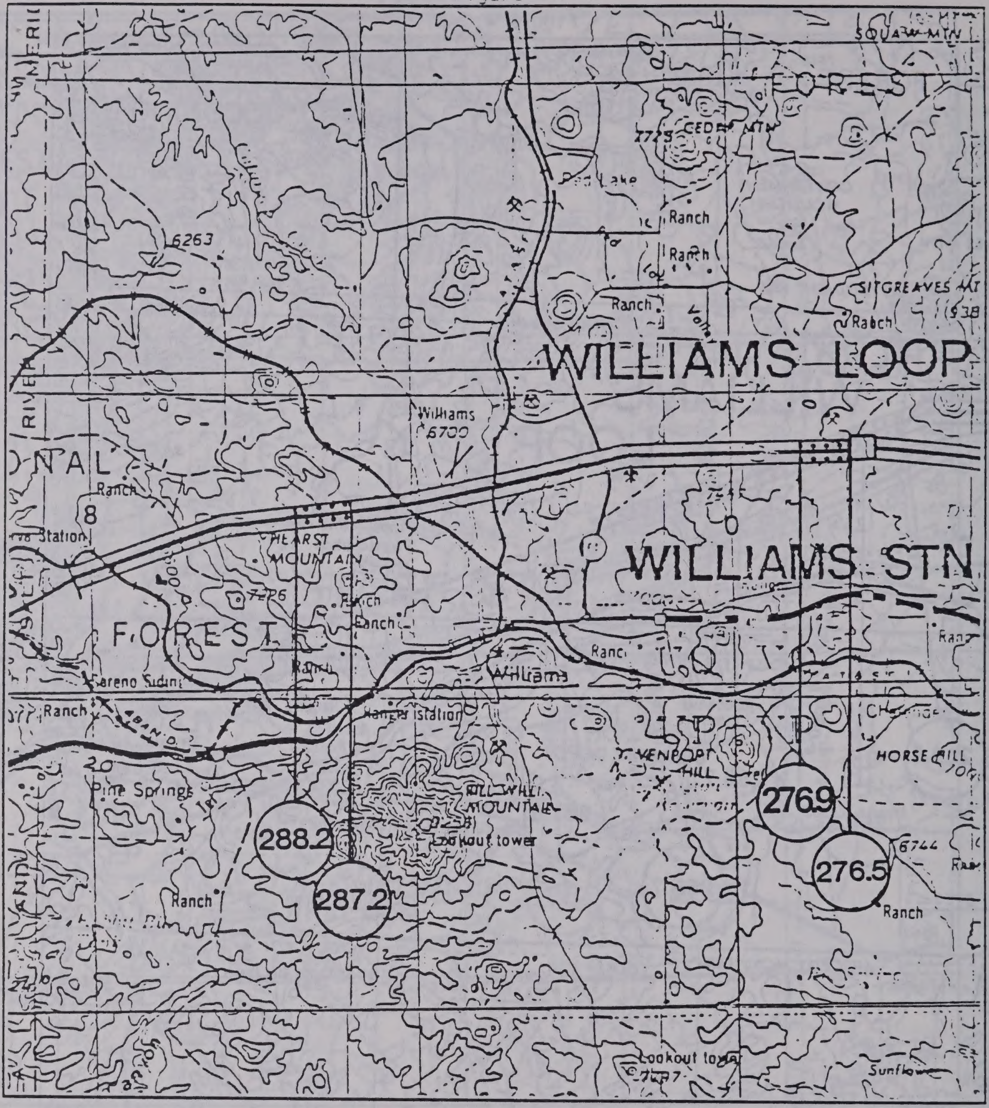
Figure 4.7-3


FOREST
7418
8000
COCONINO NATI
SAN FRANCISCO
GOVERNMENT MOUNTAIN
REAVES MTN
GOVERNMENT HILL
Arizona Snow Bowl Resort
AGASSIZ PEAK
7953
WILD BILL HILL
Ranch
WILLIAMS LOOP
2
3
4
7503
8000
7327
Fort Valley Experimental Forest Station
Parks
Maine
VOLUNTEER MTN
Bellemont
Lookout Tower
ARMY DEPOT
ATCHISON TOPEKA AND SANTA FE
Ranch
Riordan
FLAGSTAFF
Lowell Observatory
Radio Tower
Reservation
Observatory
Ranch
Lake
Ranger station
7000
7100
6755
Ranch
WOODY MTN
8075 Lookout Tower
SLIKER HILL
7300
Ranch
269.5
268.5
266.7
265.7
263.6
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH

Visual Resources, El Paso Williams A Loop

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

Figure 4.7-4


SQUAW MTN
FOREST
CEDAR MTN
7725
Red Lake
Ranch
Ranch
Ranch
SITGREAVES MT
Ranch
6263
WILLIAMS LOOP
RIVER
ONAL
Williams
6700
Ranch
8
Station
HEARST MOUNTAIN
7276
Ranch
Ranch
WILLIAMS STN
FOREST
Williams
Ranch
Ranger station
Ranch
20
Pine Springs
DAVENPORT HILL
HORSE HILL
BILL WILLIAMS MOUNTAIN
Lookout tower
288.2
287.2
276.9
276.5
6744
Ranch
Ranch
Lookout tower
7127
Sunflower

LEGEND

PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5 IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH

Visual Resources, El Paso Williams A and B Loops

SOURCE: BUREAU OF LAND MANAGEMENT TAKATA ASSOCIATES create a long-term recovery rate. These impacts are not significant (Figure 4.7-4).

Williams B Loop

MP 287.2-288.2, VRM/VQO: FS Class PR
Description: This segment of the route in the Kaibab National Forest would create a low visual impact because of existing modifications. The pipeline would be visible to east and west-bound motorists on Interstate 40 (both east and west-bound traffic) and Forest Route 124, and from recreational users of the forest. Slow forest rejuvenation would create a long-term recovery rate. These impacts are not significant (Figure 4.7-4).

4.7.2.13 System Safety and Reliability

The 600 Mmcfd alternatives also do not pass near any populated areas expect that the Laguna Loop passes within 100 feet of six yhouses and the western end of the Leupp Loop passes near populated areas.

4.7.3 Northwest Expansion Project

4.7.3.1 Air Quality

This section provides information concerning the emissions and impacts of air pollutants resulting from the construction and operation of the Northwest Expansion Project.

4.7.3.1.1 Project Emissions

An air quality impact analysis was not performed for construction of the Northwest Expansion Project since none of the project's facilities would be constructed within California. The rational for this is discussed in Section 4.2.1.1.1.

Operational phase emissions would result from natural gas combustion at each of the four compressor stations. Since compressor equipment specifications have not yet been developed, best engineering judgement was used to estimate specific equipment sizes at each compressor station. Table 4.7-21 presents the equipment size assumptions for both the 100 and 200 MMcfd projects which were used in the air quality impact analysis. Each compressor was assumed to operate continuously at 100 percent load. Additional combustion emissions were assumed to result from occasional testing of an emergency generator.

Table 4.7-21

COMPRESSOR STATION EQUIPMENT ASSUMPTIONS, NORTHWEST EXPANSION PROJECT

Compressor Station	Assumed Equipment Size (hp) 100 MMcfd	Assumed Equipment Size (hp) 200 MMcfd
Green River 1/	4 x 2000	4 x 2000
Cahone	1 x 3680	2 x 4480
Ignacio 2/	1 x 3000	2 x 3000
Cisco	2 x 2845	2 x 4480

1/ Emissions were calculated for both the existing compressor station (4 x 1,500 hp) and the expansion (4 x 2,000 hp).

2/ Emissions were calculated for only the expansion (1 x 3,000 hp) and (2 x 3,000 hp). As of 1986, the Ignacio Station had 61,530 hp at the site. Based on the results of latter expansion case, a PSD permit will be required.

NOx, HC and CO emission estimates were based on AP-42 [EPA, 1985] emission factors. Worst-hour and annual emission estimates from each compressor station are summarized in Table 4.7-22. SO_2 and particulate emissions would be negligible. Fugitive hydrocarbon emissions from valves, flanges, etc. would also be negligible. Whatever small emissions do occur would be primarily photochemically nonreactive. Additional information concerning production phase emissions can be found in the Air Quality Technical Report.

4.7.3.1.2 Operational Phase Impacts

Short- and long-term impacts from operations at the Green River, Cisco, Cahone, and Ignacio Compressor Stations are presented in Tables 4.7-23 and 4.7-24.

4.7.3.2 Geology

The discussion of geological impacts includes geologic hazards to the pipeline and potential impacts of the project on the geologic environment. The potential geologic hazards identified for the Northwest Expansion Project, which includes seven loops and one compressor station, are summarized in Table 4.7-25. Implementation of ~~the~~ applicable mitigation measures in Sections ~~4.10.3~~ 3.1.2 and 3.1.16 of Volume III would reduce the risks associated with geologic hazards to acceptable levels.

Table 4.7-22

WORST-HOUR AND ANNUAL EMISSION ESTIMATES, AIR QUALITY IMPACTS, NORTHWEST EXPANSION PROJECT COMPRESSOR STATIONS

	THC	NOx	SO2	CO	TSP	PM10
100 MMcfd						
Green River (existing)						
worst-hour (lb/hr)	61.50	152.16	0.03	19.65	0.00	0.00
annual (tons/year)	255.00	630.93	0.11	81.50	0.00	0.00
Green River (proposed)						
worst-hour (lb/hr	80.90	200.16	0.03	25.85	0.00	0.00
annual (tons/year)						
Cahone						
worst-hour (lb/hr)	38.99	96.48	0.02	12.46	0.00	0.00
annual (tons/year)	156.43	387.05	0.06	49.99	0.00	0.00
Ignacio						
worst-hour (lb/hr)	3.90	16.86	0.06	4.35	0.00	0.00
annual (tons/year)	2.71	38.32	0.05	14.48	0.00	0.00
Cisco						
worst-hour (lb/hr)	58.49	144.72	0.02	18.69	0.00	0.00
annual (tons/year)	241.83	598.34	0.10	77.29	0.00	0.00
200 MMcfd						
Green River (existing)						
worst-hour (lb/hr)	61.50	152.16	0.03	19.65	0.00	0.00
annual (tons/year)	255.00	630.93	0.11	81.50	0.00	0.00
Green River (proposed)						
worst-hour (lb/hr)	80.90	200.16	0.03	25.85	0.00	0.00
annual (tons/year)	339.97	841.17	0.14	108.65	0.00	0.00
Cahone						
worst-hour (lb/hr)	90.21	223.20	0.04	28.83	0.00	0.00
annual (tons/year)	380.76	942.09	0.16	121.69	0.00	0.00
Ignacio						
worst-hour (lb/hr)	4.50	25.56	0.03	7.65	0.00	0.00
annual (tons/year)	5.34	76.42	0.11	28.94	0.00	0.00
Cisco						
worst-hour (lb/hr)	90.21	223.20	0.04	28.83	0.00	0.00
annual (tons/year)	380.76	942.09	0.16	121.69	0.00	0.00

Table 4.7-23
WORST-HOUR AND ANNUAL OPERATIONS, AIR QUALITY IMPACTS, COMPRESSOR STATIONS, WYOMING
(all values are in ug/m3)

Pollutant	Wyoming Standard	Federal Primary Standard	Federal Secondary Standard	Project Impacts		
				Project Increment	Background	Total
EXISTING GREEN RIVER COMPRESSOR STATION, SOUTHWEST WYOMING						
Worst-Hour						
Carbon Monoxide (CO)						
1-hr average	40,000	40,000	40,000	55	17,000	17,055
8-hr average	10,000	10,000	10,000	38	9,000	9,038
Sulfur Dioxide (SO2)						
3-hr average	--	--	1,300	0	419	419
24-hr average	260	365	--	0	183	183
Total Suspended Particulates (TSP)						
24-hr Average	150	260	150	0	353	353
Annual						
Nitrogen Dioxide (NO2)	100	100	100	7	38	45
Sulfur Dioxide (SO2)	52	78	--	0	26	26
Total Suspended Particulates (TSP)	60	75	60	0	353	353
EXPANDED GREEN RIVER COMPRESSOR STATION						
Worst-Hour						
CO 1-hr Average	40,000	40,000	40,000	50	17,000	17,050
8-hr Average	10,000	10,000	10,000	36	9,000	9,036
SO2 3-hr Average	--	--	1,300	0	419	419
24-hr Average	260	365	--	0	183	183
TSP 24-hr Average	150	260	150	0	353	353
Annual						
NO2	100	100	100	7	38	45
SO2	52	78	--	0	26	26
TSP	60	75	60	0	58	58

Background values were taken from:
NO2 - Bountiful (UT)
SO2 - Bountiful (UT)
TSP - Evanston (WY)
CO - Bountiful (UT)

Table 4.7-24

WORST-HOUR AND ANNUAL OPERATIONS, AIR QUALITY IMPACTS, CISCO, CAHONE, AND IGNACIO COMPRESSOR STATIONS (100 AND 200), EASTERN UTAH AND SOUTHWEST COLORADO

(all values are in ug/m3)

Pollutant	Avg. Time	State and Federal Standards		Project Impacts		
		Primary	Secondary	Project Increment	Background	Total
CISCO (100) COMPRESSOR STATION, EASTERN UTAH						
Worst-hour						
Carbon Monoxide (CO)	1-hr	40,000	40,000	21	17,000	17,021
	8-hr	10,000	10,000	15	9,000	9,015
Sulfur Dioxide (SO2)	3-hr	--	1,300	0	419	419
	24-hr	365	--	0	183	183
Total Suspended Particulates (TSP)	24-hr (Geo. Mean)	260	150	0	353	353
Annual						
Nitrogen Dioxide (NO2)		100	100	19	38	57
Sulfur Dioxide (SO2)		80	--	0	26	26
Total Suspended Particulates (TSP)		75	60	0	52	52
CISCO (200) COMPRESSOR STATION						
Worst-hour						
CO	1-hr	40,000	40,000	21	17,000	17,021
	8-hr	10,000	10,000	15	9,000	9,015
SO2	3-hr	--	1,300	0	419	419
	24-hr	365	--	0	183	183
TSP	24-hr (Geo. Mean)	260	150	0	353	353
Annual						
NO2		100	100	22	38	60
SO2		80	--	0	26	26
TSP		75	60	0	58	58
Background values were taken from: NO2 - Bountiful (UT) SO2 - Bountiful (UT) TSP - Evanston (WY) CO - Bountiful (UT)						
CAHONE (100) COMPRESSOR STATION						
Worst-hour						
CO	1-hr	40,000	40,000	11	23,000	23,011
	8-hr	10,000	10,000	8	8,000	8,008
SO2	3-hr	--	1,300	0	707	707
	24-hr	365	--	0	131	131
TSP	24-hr (Geo. Mean)	260	150	0	182	182
Annual						
NO2		100	100	6	0	6
SO2		80	--	0	26	26
TSP		75	60	0	60	60

Table 4.7-24 (continued)

WORST-HOUR AND ANNUAL OPERATIONS, AIR QUALITY IMPACTS, CISCO, CAHONE, AND IGNACIO COMPRESSOR STATIONS (100 AND 200), EASTERN UTAH AND SOUTHWEST COLORADO

(all values are in ug/m3)

Pollutant	Avg. Time	State and Federal Standards		Project Impacts		
		Primary	Secondary	Project Increment	Background	Total
CAHONE (200) COMPRESSOR STATON						
Worst-Hour						
CO	1-hr	40,000	40,000	21	23,000	23,021
	8-hr	10,000	10,000	15	8,000	8,015
SO2	3-hr	--	1,300	0	707	707
	24-hr	365	--	0	131	131
TSP	24-hr (Geo. Mean)	260	150	0	182	182
Annual						
NO2		100	100	12	0	12
SO2		80	--	0	26	26
TSP		75	60	0	60	60
IGNACIO (100 OR 200) COMPRESSOR STATION 1/						
Worst-Hour						
CO	1-hr	40,000	40,000	223 (411) 2/	23,000	23233 (23411)
	8-hr	10,000	10,000	128 (226)	8,000	8128 (8226)
SO2	3-hr	--	1,300	0	707	707
	24-hr	365	--	0	131	131
TSP	24-hr (Geo. Mean)	260	150	0	182	182
Annual						
NO2		100	100	47	0	47
SO2		80	--	0	26	26
TSP		75	60	0	60	60

1/ Impacts for the 200 MMcfd case are shown in parentheses'
2/ Impacts from the existing facility are reported as part of the project increment

Background values were taken from:
CO - Farmington (NM)
NO2 - Reservation (NM)
SO2 - Reservation (NM)
TSP - Durango (CO)
SO2 - Annual - Bountiful (UT)

Table 4.7-25

SIGNIFICANT GEOLOGIC HAZARDS, NORTHWEST EXPANSION PROJECT

Milepost	Location	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Flash Flooding
437.3-402.7	Muddy Creek Loop	-	-	-	X
391.7-387.6	Green River Loop	-	-	-	X
329.8	Vernal Station	-	-	-	-
277.7-246.9	Rangely Loop A	-	-	X	X
239.9-223.7	Rangely Loop B	-	-	X	X
195.6-169.9	Cisco Loop	-	-	-	X
145.6-110.8	Moab Loop	-	X	-	X
67.9-51.6	Cahone Loop	X	X	-	X

Geology and Physiography. Comments made regarding general geologic and physiographic impacts of the El Paso Expansion Proposal in Section 4.7.1.2.1 also apply to the Northwest Expansion Project.

Seismicity and Faulting. The low to moderate seismicity throughout the region is not considered to represent a significant strong ground shaking hazard to the proposed facilities. There is a very low probability that vibratory ground motions anticipated over the life of the project would be intense enough to cause significant soil liquefaction, lurching, or spreading. Possible exceptions are portions of the Moab and Cahone Loops.

Surface rupture occurring along the Moab and Cahone Loops is a hazard since faults that have experienced Quaternary movement would be crossed or paralleled. Such faults have the potential to cause both strong ground shaking and rupture of the pipe during the design life of the pipeline. The effects of strong ground shaking on the various project facilities depend on their design parameters. The buried pipeline would be relatively insensitive to vibratory shaking because it is flexible enough to deform somewhat with the surrounding soil.

Secondary seismic effects triggered by strong ground shaking can be more serious than the shaking itself. Soil liquefaction, with or without spreading, can occur in unconsolidated, generally low bulk-density, saturated soils subjected to moderate to strong ground shaking. Ground movement or loss of support due to liquefaction could damage the pipeline. Alluvial and eolian deposits along the Moab and Cahone Loops may be susceptible to these effects where the groundwater table is high.

Moderate to strong ground shaking can trigger renewed movement or enlargement of existing landslides and induce new failures. Locally steep slopes along the Moab Loop could be susceptible to failure from seismic shaking.

Slope Stability. Slope failures can occur from above-normal available moisture, seismic shaking, construction grading, and other natural or man-related causes. If the pipeline is buried in slopes which subsequently fail, the pipeline could be sheared. The rugged mountains surrounding the Rangely Loops A and B are highly susceptible to slope failures. The Wasatch and the Green River Formations are particularly slide-prone units. Landsliding has been a significant and on-going problem for Northwest in the areas both north and south of Douglas Pass. ~~Northwest's existing mainline, other pipelines in the area and Highway 139 have been damaged due to landsliding a number of times.~~ Landslides are an annual event in this area. Highway 139 is closed each spring due to landslides. The existing Northwest Pipeline mainline ruptured in 1983 and 1986 and is shut-in about twice a year for preventative maintenance. Northwest currently maintains slope movement and pipeline strain monitoring instruments in the area, and uses a strain-relief excavation procedure as a temporary remedial measure.

Subsidence. Alluvial fan and eolian deposits could be susceptible to hydrocompaction where they occur above the water table. If the deposits undergo a significant increase in moisture content, they could compact, settle up to 20 percent, or crack, causing damage to the pipeline and compressor station foundations. Such deposits are widespread in arid and semiarid regions. However, it is unlikely that pipeline construction and operation would cause significant hydrocompaction.

Unique Geologic Features. Sand dunes located along the Muddy Creek, Moab, and Cahone Loops have the potential to migrate. If the pipeline is constructed in sand dunes, migration of those dunes could uncover the pipeline and/or remove support from beneath it. No unique geological features would be significantly affected by construction of these facilities.

Flooding and Debris Flows. The loops would cross several intermittent and perennial streams which have the potential to flood during snowmelt and/or extended periods of rainfall. Related to the flood hazard is the danger of debris flows. Debris flows generally develop in narrow, steep-walled canyons where there is an abundance of erodible material. If the pipeline is not buried when it crosses such steep, narrow canyons, the risk of damage to the pipeline from floods and debris flows is high. Also related to the flood hazard is the mass failure of the high vertical streambanks ~~in the meandered loops~~ of Douglas and West Douglas Creeks. ~~If the outside banks on stream loops are not protected, s~~Streambank failure could leave the pipeline hanging in midair ~~within~~ without support.

Geologic Resources. No significant adverse impacts to current development or planned extraction of geologic resources are expected to result from implementation of the project. Potential impacts to all mineral resources and leases of these resources should be alleviated by negotiations with the appropriate land agency/owner.

4.7.3.3 Soil

Impacts to soils that could result from construction of the loops are classified as significant or not significant based on the degree or magnitude of impact as measured against scientific criteria. Refer to Section 4.2.3 for criteria used to delineate significant impacts as well as a detailed discussion on general impacts to soils caused by pipeline construction and operation.

Table 4.7-26 summarizes the distribution of potential impacts, as a function of water and wind erosion potential and reclamation potential, that could occur as a result of constructing and operating the project.

Table 4.7-26

DISTRIBUTION OF POTENTIAL SOIL IMPACTS, NORTHWEST EXPANSION PROJECT

		Erosion Potential 1/						Reclamation Potential 2/		
		Water (miles) 3/			Wind (miles) 3/			(miles) 3/		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
437.3 - 402.8	Muddy Creek Loop	21.6	12.4	0.5	1.0	28.2	5.3	1.0	16.0	17.5
391.7 - 387.6	Green River Loop	2.9	0.7	0.5	1.0	2.6	0.5	0.0	0.2	3.9
277.7 - 246.9	Rangely Loop A	25.8	2.5	2.5	8.1	22.7	0.0	3.5	6.0	21.3
239.9 - 223.7	Rangely Loop B	13.7	1.8	0.7	0.5	15.7	0.0	15.2	0.0	1.0
195.6 - 169.9	Cisco Loop	17.2	8.0	0.5	7.6	18.1	0.0	0.1	2.7	23.0
145.6 - 110.8	Moab Loop	26.0	7.0	1.8	17.4	11.4	6.0	1.5	15.0	18.3
67.9 - 51.6	Cahone Loop	10.9	4.2	1.2	1.8	14.5	0.0	5.9	4.4	6.0

1/ Water Erosion Potential
L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).
M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).
H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential
L(low) = low probability for significant erosion impact.
M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.
H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

2/ Reclamation Potential
Ratings are based upon trenching with no selective soil handling or other mitigation.
G(good) = good probability for restoring vegetation which will support pre-existing land use. Productivity potential may be somewhat reduced.
F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.
P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

3/ Cumulative miles for pipeline segment.

Muddy Creek Loop. There is mostly a low potential for significant water erosion along this loop. The potential for wind erosion is moderate. Reclamation potential is predominantly poor and fair suggesting there is a relatively low probability of reclamation success. There is an even chance that significant impacts to soils could occur along this loop.

Green River Loop. The potential for significant water and wind erosion is mostly low and moderate. Reclamation potential is mostly fair and poor. There is an even chance that significant impacts to soils could occur along this loop.

Vernal Station. The potential for significant water and wind erosion is moderate. The potential for significant reclamation success is poor. Overall there is an even chance that significant impacts could occur to the soils.

Rangely Loop A. The potential for significant wind and water erosion is mostly low to moderate, although the potential for significant erosion of vertical cutbanks along Douglas Creek is high. The potential for significant reclamation success is mostly fair to poor, suggesting that there is a low probability for short-term reclamation success.

Rangely Loop B. The potential for significant wind and water erosion is mostly low to moderate. The potential for successful reclamation is good. Overall the potential for significant impact to the soils is mostly low, but in some places an even chance.

Cisco Loop. The potential for significant water erosion is mostly low to moderate, but with some areas with high potential. The potential for significant wind erosion is mostly low and moderate. Reclamation potential is poor. Overall there is a near even chance that the potential for significant impact to soils is high.

Moab Loop. The potential for significant water erosion is mostly low with some areas with a moderate potential. The potential for significant wind erosion is low and moderate. Reclamation potential is predominantly low. Overall there is a near even chance that the potential for significant impact to soils is high.

Cahone Loop. The potential for significant water erosion is mostly low to moderate with some areas with high potential. The potential for significant wind erosion is mostly moderate with some areas of low potential. Reclamation potential is distributed evenly from poor to good. Overall there is an even chance that impacts to soils would be significant.

4.7.3.4 Surface Water

The significance criteria and general description of impacts that could occur to surface water resources due to pipeline construction presented in Section 4.2.4 apply to the expansion project.

The applicant has not presented plans for hydrostatically testing the new pipeline segments. Surface water available for hydrostatic testing is relatively meager along the expansion project. Therefore, the potential for significantly impacting surface water resources due to withdrawal for hydrostatic testing is high. Similarly, no plans have been presented for the control of hydrostatic test water discharge. The potential for significant impact resulting from the discharge of the test water would be high.

Muddy Creek Loop. Construction of the pipeline through Blacks Fork would disrupt the channel bed causing an increase in sediment loading of the river. This impact would likely be of short duration and if appropriate mitigation plans are applied, would not be significant. No significant impacts would occur as a result of constructing, operating, and abandoning the loop.

Green River Loop, Vernal Station, Cisco Loop, Moab Loop. No significant impacts would occur as a result of constructing, operating, and abandoning the loops or facility assuming standard operating and mitigative measures are applied.

Rangely Loop A. Since all of this loop would cross or parallel Douglas Creek, there is a high probability that significant impact to the creek could occur. Douglas Creek has eroded 100-foot cutbanks exposing once well-located pipelines in the utility corridor. In addition to crossing the creek three times, approximately 41 tributaries to Douglas Creek would also be crossed. Thus, the cumulative effect would be an increase in sediment loading to Douglas Creek. The relatively steep slopes of the mountainous country that the loop would traverse and its close proximity to Douglas Creek would also increase the hazard of increased erosion and stream sedimentation from the ROW. This increase could be significant unless appropriate mitigation measures are followed.

Rangely Loop B. The description of impacts to East Salt Creek would be essentially the same as for Douglas Creek along Rangely Loop A previously described since the location, setting, and orientation of the loop is very similar.

Cahone Loop. There would be no significant impact to the ~~approximately 27 ephemeral or~~ several intermittent streams that would be crossed. ~~would be expected.~~ However, Brumley Draw, a perennial stream, has a moderate sensitivity to crossing and the potential for significant impact would be moderate to high unless appropriate mitigation measures are applied. Significant impact could occur to irrigation systems along the loop; however, measures to reduce impacts as well as disruption of the facilities would remove the significance potential.

4.7.3.5 Groundwater

Comments made regarding groundwater impact in Section 4.2.5 of the Mojave Proposal also apply to the Northwest Expansion Project. Specific groundwater impacts that could occur due to construction, operation, and abandonment of the Northwest Expansion Project are presented in Table 4.7-27. Approximately 47 miles of low potential groundwater impacts could occur along the Northwest expansion project.

Table 4.7-27

GROUNDWATER IMPACTS, NORTHWEST EXPANSION PROJECT

	Miles of Significant Impact			
Loop	High	Medium	Low	Comments
Muddy Creek	-	-	-	Shallow to moderate depth to water, at stream crossings, low use
Green River	-	-	-	Moderate to great depth to water, at stream crossings, low use
Vernal Station	-	-	-	Poor quality, low use
Rangely A	-	-	30.8	Shallow to moderate depth to water, low use
Rangely B	-	-	16.2	Shallow to moderate depth to water, low use
Cisco	-	-	-	Great depth to water, low use
Moab	-	-	-	Great depth to water, low use
Cahone	-	-	-	Moderate to great depth to water, low use

4.7.3.6 Freshwater Biology

Impacts on freshwater resources resulting from pipeline construction would be primarily related to water quality problems associated with construction activities. A general overview of the expected water quality impacts is given in Section 4.7.3.4. The primary factors which would affect freshwater resources are sedimentation and the location and rates of water withdrawal and discharge for hydrostatic testing. Increased suspended sediments can decrease benthic invertebrate production by siltation of benthic habitat.

Fish are also affected by increased turbidity, which can decrease food availability (i.e., benthic invertebrates), feeding efficiency, and the amount of spawning habitat.

Withdrawal and release of water for hydrostatic testing can affect aquatic resources by direct mortality of fish during water intake and by instream habitat reduction as a result of flow withdrawals at the source. Water released from hydrostatic test can exhibit low water quality.

Criteria for determining delineating significant impacts are listed in full in Section 4.2.6.

~~None of the loops or facilities for the Northwest expansion would cross streams with significant aquatic resources.~~ Although the Northwest Expansion does not cross any streams with significant sport fisheries, it does cross streams possessing aquatic resources that provide a potential downstream food source for fish and a local food source for terrestrial vertebrates. These aquatic resources are relatively scarce within the project area and can be locally important. ~~Therefore~~ However, no significant impacts on freshwater resources would occur as a result of construction, operation and abandonment of the loops or facility assuming standard operating and mitigative measures were applied.

4.7.3.7 Terrestrial Biology

4.7.3.7.1 Vegetation

Criteria used to determine the significance of impacts associated with construction of the Northwest Expansion Project are the same as those discussed in Section 4.2.7.1.1 for the Mojave Mainline.

Denudation of vegetation would be the major impact associated with construction of the loop expansions. A 100-foot wide construction ROW would be cleared of vegetation, both within native vegetation and in existing ROW. The width of native vegetation that would need to be cleared adjacent to the existing pipeline ROW would be 60 feet. A 45-foot wide operational ROW would be maintained by not allowing large woody shrubs and trees from reestablishing within the ROW. Therefore, in community types such as pinyon-juniper woodland, there would be a long-term loss of trees within a 5-foot wide zone adjacent to the existing ROW.

The duration of impacts associated with removal of vegetation types has been previously discussed in Section 4.2.7.1 for the Mojave proposal. The duration of impacts for each vegetation type are identified in Table 4.7-28. Impacts relating to noxious weed invasion could be potentially significant within any community type. Without proper control measures, noxious grasses, forbs, and shrubs could become established on the pipeline ROW. Once established, the prolific and competitive nature of these weedy species may preclude establishment of desirable species.

Land use associated with vegetal production that would be affected by removal of vegetation includes livestock grazing, recreation, agriculture, and wildlife habitat. Grazing allotments would experience some loss in carrying capacity. Refer to Section 4.7.3.7.3 for a detailed assessment of impacts to the range resource. Impacts to wildlife habitat resulting from the removal of vegetation could be significant and are addressed in Section 4.7.3.7.2.

Construction and operation of the cumulative 162.4 miles of loop expansions would denude approximately 1,968.3 acres of vegetation including both native, and plants within the existing ROW. Table 4.7-28 lists the vegetation types and acreages of each type that would be removed during construction of the loop expansions. The loss of approximately six acres of wetland/riparian vegetation associated with perennial and intermittent drainages and 245 acres of agricultural land traversed by the expansion would be considered a significant impact (Class II). All other losses of vegetation community types would not be considered significant (Class III).

Field surveys for four federally listed species itemized in Table 3.6-31 were conducted in July 1986 by qualified field botanists along portions of the route. The results of the surveys are included in the following discussion. Numerous additional sensitive plant species may occur along the routes. Since the field surveys did not include searches for these species, impact assessment can only be based on available literature which is usually not sufficient for definite impact assessment.

Muddy Creek Loop. A total of 420 acres of vegetation would be denuded along this loop. Approximately 0.4 acres of wetland/riparian vegetation would be denuded (Class II impact). The sites of these impacts occur where the pipeline would cross the Blacks Fork and other intermittent drainages. No plant species of special concern would be impacted by the construction and operation of this loop.

Table 4.7-28

VEGETATION TYPES AND DENUDED ACREAGES, NORTHWEST EXPANSION PROJECT

Loop/ Geographic Region	Vegetation Type	Impact Class 2/	Denudation 1/ (acres)				
				Native Vegetation 4/			
			ROW 3/	Short Term	Long Term	Perma-nent	Total
Wyoming Basin							
Muddy Creek	Mixed desert shrub	III	167.1	250.6	0	0	417.7
	Wetland/riparian	II	0.2	0.2	0	0	0.4
		Subtotal	167.3	250.8	0	0	418.1
Green River	Mixed desert shrub	III	19.9	29.8	0	0	49.7
Colorado Plateau							
Vernal Substation	Mixed desert shrub	III	0	0	0	0	0
Rangely A	Mixed desert shrub	III	26.2	39.3	0	0	65.5
	Greasewood	III	45.1	67.6	0	0	112.7
	Pinyon-juniper woodland	III	60.1	82.7	7.5	0	150.3
	Agricultural land	II	20.6	0	0	0	20.6
	Sagebrush scrub	III	9.2	13.8	0	0	23.0
	Wetland/riparian	II	0.5	0.7	0	0	1.2
		Subtotal	161.7	204.1	7.5	0	373.3
Rangely B	Sagebrush scrub	III	19.9	29.8	0	0	49.7
	Pinyon-juniper woodland	III	9.7	13.1	1.2	0	24.0
	Agricultural land	II	33.7	0	0	0	33.7
	Greasewood	III	29.9	44.7	0	0	74.6
	Mixed desert shrub	III	5.3	8.0	0	0	13.3
	Wetland/riparian	II	0.4	0.5	0	0	0.9
		Subtotal	98.9	96.1	1.2	0	196.2
Cisco	Mixed desert shrub	III	123.8	185.7	0	0	309.5
	Wetland/riparian	II	0.8	1.2	0	0	2.0
		Subtotal	124.6	186.9	0	0	311.5
Moab	Mixed desert shrub	III	85.8	128.7	0	0	214.5
	Pinyon-juniper woodland	III	54.8	75.4	6.9	0	137.1
	Sagebrush scrub	III	16.0	24.0	0	0	40.0
	Greasewood	III	11.8	17.7	0	0	29.5
	Wetland/riparian	II	0.3	0.5	0	0	0.8
		Subtotal	168.7	246.3	6.9	0	421.9
Cahone	Agricultural land	II	191.0	0	0	0	191.0
	Sagebrush scrub	III	1.4	2.2	0	0	3.6
	Pinyon-juniper woodland	III	1.0	1.4	0	0	2.4
	Wetland/riparian	II	0.2	0.4	0	0	0.6
		Subtotal	193.6	4.0	0	0	197.6
		TOTAL	934.7	1018.0	15.6	0	1968.3

Table 4.7-28 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, NORTHWEST EXPANSION PROJECT

	Impact Class 2/	Denudation 1/ (acres)				
			Native Vegetation 4/			
		ROW 3/	Short Term	Long Term	Perma-nent	Total
Summary of Vegetation Type						
Mixed desert shrub	III	428.1	642.1	0	0	1070.2
Greasewood	III	86.8	130.0	0	0	216.8
Pinyon-juniper woodland	III	125.6	172.6	15.6	0	313.8
Agricultural land	II	245.3	0	0	0	245.3
Sagebrush scrub	III	46.5	69.8	0	0	116.3
Wetland/riparian	II	2.4	3.5	0	0	5.9
	TOTAL	934.7	1018.0	15.6	0	1968.3
Summary by Impact Class 2/						
Class	I	0	0	0	0	0
Class	II	247.7	3.5	0	0	251.2
Class	III	687.0	1014.5	15.6	0	1717.1
Class	IV	0	0	0	0	0
	TOTAL	934.7	1018.0	15.6	0	1968.3

1/ vegetation loss assuming a 100-foot wide construction ROW, 60 feet within native vegetation and 40 feet within existing ROW vegetation.

2/ see Section 4.2.7.1 for definitions of impact classes.

3/ denudation of existing ROW vegetation assuming a 40-foot wide zone of clearing within the ROW; does not include native vegetation.

4/ native vegetation adjacent to existing ROW, denudation/disturbance 60 feet wide: short-term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short-term within the 60-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

long-term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (45-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; vegetation loss would not be significant. This loss would occur only within a 5- foot wide zone adjacent to the existing ROW as part of the 45-foot operational ROW.

permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant. This loss would occur only within the 60-foot wide portion of the 100-foot wide construction ROW within native vegetation.

Green River Loop. Approximately 50 acres of vegetation would be denuded along this loop. No wetland/riparian vegetation would be impacted as a result of construction and operation of the loop. No plant species of special concern would be impacted by the construction and operation of this loop.

~~Vernal Station. No wetland/riparian vegetation or agricultural land would be impacted as a result of construction and operation of the additional facilities at the Vernal Station. No plant species of special concern would be impacted by the construction and operation of the additional facilities at the Vernal Station.~~

Rangely Loop A. A total of 373 acres of vegetation would be denuded along this loop. Approximately 1.2 acres of wetland/riparian vegetation and 21 acres of agricultural land would be denuded (Class II impact). The areas that would be impacted are distributed along Douglas and West Douglas Creeks, and the several intermittent and perennial tributaries that drain into Douglas Creek. No plant species of special concern would be impacted by the construction and operation of the loop.

Rangely Loop B. A total of 196 acres of vegetation would be denuded along this loop. Approximately 0.9 acres of wetland/riparian vegetation and 34 acres of agricultural land would be denuded (Class II impact). The wetland/riparian vegetation that would be impacted are distributed along East Salt Creek and the several intermittent and perennial tributaries that drain into East Salt Creek. One federally listed threatened species, Uinta Basin hookless cactus, two federal candidate C3c species, and one State of Colorado sensitive species occur within the general area and habitat that would be traversed by the loop. Consequently, the potential for significant impact is high (Class II).

The southern portion of the loop was surveyed for Uinta Basin hookless cactus. No individuals were encountered within or near the ROW. Approximately 10 acres of suitable habitat distributed along five miles of pipeline route would be crossed. Consequently, individuals of the species would not be directly impacted; however, the loss of suitable habitat could significantly impact the species indirectly (Class II).

Cisco Loop. A total of 310 acres of vegetation would be denuded along this loop. Approximately 2.0 acres of wetland/riparian vegetation would be denuded (Class II impact). The areas that would be impacted are distributed along the several perennial and intermittent drainages that the loop would traverse.

One federally listed threatened species, Jones cycladenia, one candidate C3c species, and one candidate C2 species occur within the general area and habitat that would be traversed by various portions of the loop. Consequently, the potential for significant impact is high.

The southern portion of the loop was surveyed for Jones cycladenia. No individuals were encountered and no suitable habitat was identified. Therefore, this species would not be impacted.

Moab Loop. A total of 422 acres of vegetation would be denuded along this loop. Approximately 0.8 acres of wetland/riparian vegetation would be denuded (Class II impact). The areas that would be impacted are distributed along several intermittent drainages that would be crossed by the loop.

One federally listed endangered species, spineless hedgehog cactus, and one candidate C3c species occur within the general area and habitat that would be traversed by various portions of the loop. Consequently, the potential for significant impact is high (Class II).

The central portion of the Moab Loop was surveyed for spineless hedgehog cactus. No individuals were found. Scattered areas of suitable habitat were identified. Loss of this habitat could significantly impact the species by reducing the area of suitable habitat that could be exploited by the species (Class II).

Cahone Loop. A total of 198 acres of vegetation would be denuded along this loop. Approximately one acre of wetland/riparian vegetation and 191 acres of agricultural land would be denuded (Class II impact). One recently federally proposed species for listing as endangered, spreading wild buckwheat, occurs within the general area and habitat that would be traversed by various portions of the loop. Consequently, the potential for significant impact is high.

The southern portion of the loop was surveyed for spreading wild buckwheat. No individuals were found. Small areas of suitable habitat were identified along the loop. Loss of this habitat could significantly impact the species by reducing the area of suitable habitat that could be exploited by the species. Other federally listed species noted to occur in the general vicinity of this loop include the Mancos milkvetch and Mesa Verde cactus. ~~The closest known location for Mancos milkvetch is five miles southeast of Shiprock, well south of the Cahone Loop. Likewise, the closest location for the Mesa Verde cactus is 10 miles south of Cortez. Neither of these species or suitable habitat occurs along the loop.~~

Impact Summary. Approximately 1,970 acres of vegetation would be denuded by this expansion project. Of this total, approximately 250 acres of vegetation denudation would be significant, although mitigatable. The significant denudation of vegetation includes wetland/riparian vegetation and agricultural land. The loss of both these types would be relatively short term.

No federally listed plant species would be directly impacted by this expansion project. However, suitable habitat was identified for the Uinta Basin hookless cactus, spineless hedgehog cactus, and spreading wild buckwheat along various portions of the loops. The destruction of this habitat could indirectly impact (Class II) the species.

4.7.3.7.2 Wildlife

General impacts associated with construction of the Northwest Expansion Project and criteria used to assess significance of an impact are the same as described for the Mojave Mainline Proposal (Section 4.2.7.2).

Muddy Creek Loop. Golden eagle, peregrine falcon, and burrowing owl nests potentially occur within one half mile of the loop. Disturbance during nesting would be a Class II impact. Disturbance of pronghorn ~~on~~ antelope critical winter range is a Class II impact. Loss of pronghorn antelope critical winter range and general wildlife habitat along the extent of the loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferret occurrence within the approximate 1,300 acres of prairie dog colonies within one half mile of this alignment. If ferrets are present, any construction or operational activities that result in disturbance or loss of individuals would be a Class II impact. Ferrets could be lost due to construction and operation associated activities. Prairie dogs could benefit from the soil disturbance and removal of vegetation, and may occur in higher densities along the ROW after construction. This would be an increase in potential ferret habitat and a Class IV impact.

Ferruginous and Swainson's hawks potentially nest in the area of concern. Disturbance within one half mile of an active nest site of these species would be a Class II impact.

Green River Loop. No significant impacts to general wildlife would occur along this loop. Loss of general wildlife habitat along the extent of this loop would be a Class II impact.

Species of Special Concern. Ferruginous and Swainson's hawks potentially nest along this loop. No nests have presently been identified within the area of concern. Disturbance within one half mile of an active nest would be a Class II impact. Ferrets potentially occur within the region. No viable prairie dog colonies have been identified along this alignment. If ferrets are present, impacts would be the same as discussed previously for Muddy Creek Loop.

~~Vernal Substation. No significant impacts to general wildlife would occur at this substation site. Loss of general wildlife habitat would be a Class III impact.~~

~~Ferruginous and Swainson's hawks potentially nest within one half mile of the substation. At present, no active nests have been~~

~~identified within the area of concern. Disturbance within one half mile of an active nest would be a Class II impact.~~

Rangely Loop A. Three golden eagle and two red-tailed hawk nests occur within one half mile of the loop. The potential exists for other raptor nests in close proximity to the construction zone. Disturbance during nesting would be a Class II impact. Mule deer and elk ~~severe~~ winter range is traversed by the alignment. These animals tend to avoid the canyon bottom, and construction disturbance is not expected to be significant [Hollowed, 1986]. Consequently, disturbance would be a Class III impact. Loss of big game winter range and general wildlife habitat would be a Class III impact.

Species of Special Concern. Potential aeyrie sites exist for peregrine falcons. No nest sites are currently known for the area of concern. If an aeyrie exists within the zone of influence, disturbance would be Class II impact.

Rangely Loop B. Comments made in regard to general wildlife along Rangely Loop A also apply to Loop B.

Species of Special Concern. Peregrine falcons potentially nest on cliff faces of the canyon. No aeyries have currently been identified within the area of concern. If an aeyrie occurs within the zone of influence, disturbance during nesting would be a Class II impact. Two viable prairie dog colonies of an approximate total of 550 acres exist within one half mile of the ~~latter five miles of the~~ loop. These towns provide suitable habitat for black-footed ferrets. If ferrets are present, impacts would be the same as previously discussed for the Muddy Creek Loop.

~~The latter five mile segment of~~ This loop also crosses potential nesting habitat for Swainson's and ferruginous hawks. At present, no nests have been identified within the area of concern. Disturbance within one half mile of an active nest would be a Class II impact.

Cisco Loop. No significant impacts to general wildlife would occur along this loop. Loss of general wildlife habitat would be a Class III impact.

Species of Special Concern. Approximately 60 percent of this proposed loop crosses prime prairie dog habitat, and approximately 6,500 acres of active prairie dog colonies occur within one half mile of the loop. Several ferret sightings have been recorded within the general vicinity over the past few years. If ferrets are present, impacts would be the same as previously discussed for the Muddy Creek Loop.

Swainson's and ferruginous hawks are known to nest in the general area of the loop. One ferruginous hawk nest has been identified within one half mile of the alignment, and there is a strong possibility that others are present within the area of concern [Dalton, 1986]. Disturbance within one half mile of an active nest would be a Class II impact.

Moab Loop. Critical mule deer winter range is crossed by approximately ten miles of this loop. Disturbance of mule deer in this area during winter would be a Class II impact. Pronghorn fawning occurs along the extent of this loop (approximately 30 miles). Disturbance of pronghorn during fawning would push these animals into areas of high coyote density, thus significantly increasing mortality of young [Dalton, 1986]. This would be a Class II impact. Nine winter dens of the Hopi rattlesnake occur within the vicinity of this loop. Construction disturbance during Hopi rattlesnake egress from winter dens when snakes are concentrated and highly visible would result in high mortality due to crushing, entrapment in the open pipeline trench, or indiscriminate killing. This would be a Class II impact.

Species of Special Concern. One peregrine falcon aeyrie and the potential for others occur along this alignment. Disturbance within a 5-mile radius of an active nest would be a Class II impact. One viable prairie dog colony occurs along the loop. It is an isolated colony of about 200 acres. It is unlikely that this is sufficient habitat to support a black-footed ferret population.

Ferruginous and Swainson's hawks potentially nest along the extent of this alignment. At present, no nests have been identified within the area of concern. Disturbance within one half mile of an active nest would be a Class II impact.

Cahone Loop. No significant impacts to general wildlife would occur along this loop. Loss of general wildlife habitat would be a Class III impact.

Species of Special Concern. The loop lies within the historical range of the black-footed ferret, but due to the extensive agricultural development of the area, it is doubtful that suitable habitat (viable prairie dog colonies) is present in sufficient quantity to support a ferret population.

Limited Swainson's hawk nesting habitat is available in the scattered pinyon-juniper woodlands that occur along less than one mile of the alignment. No nests have been identified within the area of concern. Disturbance within one half mile of an active nest would be a Class II impact.

Summary of Significant Impacts. Table 4.7-29 presents an abbreviated form of significant impacts for this project. The Northwest Expansion Project crosses approximately 40 miles of mule deer winter and pronghorn fawning range where disturbance during the appropriate season would be a Class II impact. The route crosses approximately 78 miles of potential raptor nesting habitat; 56 of these miles are also potential nesting for species of special concern discussed below. Six ~~general~~ raptor nests have been currently identified within one half mile of the route. Disturbance of active nests would be a Class II impact. Nine Hopi rattlesnake hibernacula potentially exist within the construction zone. Construction activities during egress from these winter dens would be a Class II impact.

Table 4.7-29

SIGNIFICANT WILDLIFE IMPACTS,
NORTHWEST EXPANSION PROJECT

Wildlife Class	Impact to [1] Individuals	Impact to Habitat
General Wildlife [3]	118 miles (II) [2]	6 raptor nests (II) 9 rattlesnake dens (II)
Species of Special Concern [4]	127 miles (II)	2 raptor nests (II)

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[1] Impacts to individuals are quantified by cumulative miles of pipeline where impacts would occur.

[2] Indicates impact class: I= Significant adverse impact that could not be mitigated or avoided; II= Significant adverse impact that could be feasibly mitigated or avoided.

[3] General wildlife includes mule deer, pronghorn, raptors (excluding those covered under species of special concern) and Hopi rattlesnake.

[4] Species of Special Concern include all federally listed species and candidates.

Species of Special Concern. Approximately 60 miles of potential prairie dog habitat are crossed by the loops; active colonies occur along 41 of these miles. Approximately 2000 acres of active colonies have been identified within one half mile of the loops. Viable prairie dog colonies provide suitable habitat for the black-footed ferret. If ferrets are present, construction activities would be a Class II impact. The loops traverse approximately 45 miles of potential peregrine falcon nesting habitat. One active aeyrie has been identified within 1.5 mile of the proposed alignment. Disturbance of active nest sites would be a Class II impact. Swainson's and ferruginous hawks potentially nest along approximately 105 miles of this loop expansion project. One nest has been identified along the alignment. Disturbance within one half mile of active nests would be a Class II impact. Much of the above linear distance of Class II impacts overlap between species. The Northwest

Expansion crosses an approximate total of 127 miles of Class II impact to species of special concern.

4.7.3.7.3 Grazing

The criteria for evaluating significant and general impacts to grazing are the same as those discussed in Section 4.2.7.3 of this document. Given the above referenced criteria for significant impacts and scenario for the proposed action, no potential impacts to grazing were noted along any of the loops of the Northwest Expansion. The project would affect less than one percent of any allotment traversed as noted in Appendix D.

It should be noted, however, that fencing and livestock guards are very important in maintaining livestock control and separation for the affected allotments. Maintaining that separation and control is of paramount importance to the permittees' and private landowners' grazing enterprises.

4.7.3.8 Socioeconomics

4.7.3.8.1 Population, Housing, and Economic Impacts

Regardless of which El Paso Case is constructed other than the proposed base case, Northwest Pipeline Corporation will deliver either 100 MMcfd or 200 MMcfd to El Paso. ~~This will~~ Delivery of 200 MMcfd would require approximately 162 miles of additional looping, two new compressor stations, and the refitting of two additional existing compressor stations. The delivery of 100 MMcfd rather than 200 MMcfd would require considerably less construction, and the economic impact would be correspondingly less. In the analysis presented here, the 200 MMcfd expansion is analyzed.

The construction of the Northwest expansion would occur in Lincoln and Sweetwater Counties, Wyoming; Rio Blanco, Garfield, Mesa, Dolores and Montezuma Counties, Colorado; and Grand and San Juan Counties in Utah. The methodology for impact estimation is identical to that for El Paso described in Section 4.7.1.8.1.

Table 4.7-30 presents the aggregate socioeconomic impacts of the Northwest expansion. If all construction occurs simultaneously, a total of 570 local construction personnel could be employed. An estimated 1,185 nonlocal construction personnel could come into the study area to work, bringing with them 327 dependents; total inmigration will be 1,407. The nonlocal workers might spend approximately $8.5 million in the local economy. Local residents will spend a similar amount locally with the wages they earned constructing the Northwest expansion. The contractors will spend approximately $2.1 million in the study region in primarily miscellaneous goods and services.

Table 4.7-30

AGGREGATE SOCIOECONOMIC IMPACT INFORMATION, NORTHWEST EXPANSION PROJECT

Characteristics	Wyoming Loops	Colorado Loops	Utah Loops	Green River Station	Cahone Station	Ignacio Station	Cisco Station
Location	Lincoln/ Sweetwater, WY	Rio B./Garf./ Mesa/Dol./ Mont., CO	Grand/San Juan, UT	Sweetwater, WY	Dolores, CO	La Plata, CO	Grand, UT
Length (miles)	38.6	63.1	60.2	n/a	n/a	n/a	n/a
Construction duration (days)	83	136	130	7	150	7	150
Construction crew	350	350	350	145	145	145	145
Other personnel required for construction	27	27	27	11	11	11	11
Local construction personnel	122	122	122	51	51	51	51
Nonlocal construction personnel	255	255	255	105	105	105	105
Dependents of nonlocal personnel	77	77	77	32	32	32	32
Total immigrant population	332	332	332	137	137	137	137
Housing demand by immigrants (units):							
Hotels/Motels	110	110	110	45	45	45	45
Rental Units	71	71	71	29	29	29	29
R/V Campsites	69	69	69	28	28	28	28
Other		5	5	5	2	2	2
Local expenditures by nonlocal construction personnel	$1,454,459	$2,377,626	$2,268,353	$51,765	$1,078,875	$51,765	$1,078,875
Local expenditures by local construction personnel	1,479,081	2,417,875	2,306,753	53,442	1,113,840	53,442	1,113,840
Local expenditures by contractors	380,650	622,255	593,657	52,000	189,000	52,000	189,000

Operation Personnel Total = 0

SOURCES:

Pipeline construction activities were assumed to be similar to Transwestern Spread No. 2. The duration of construction for the loops was adjusted based on length. Addition of compression is assumed to require the same workforce size as a compressor installation. However, the duration of construction was assumed to be correspondingly less based on the relative construction costs. It was assumed that addition of compression has a similar cost as rewheeling. Duration of construction was based on the relationship between $272,000, the direct cost of rewheeling, and $5,669,000, the cost of a compressor station. The new Cahone and Cisco compresssors stations were assumed to be constructed in the same manner as the Topock compressor station in the Mohave project due to the lack of any other data. Dependents were estimated at .3 dependents per immigrant [BLM, 1979]. Local expenditures for contractors were derived on a per mile basis from El Paso Project cost data [El Paso Natural Gas Company, 1985]. No operation personnel are noted in the operation budget for the El Paso Project, and that assumption was carried through here.

Table 4.7-31 presents the contribution to local tax bases the pipeline can be expected to make. The increase in assessed valuation ranges from a third of one percent of the existing tax base in Mesa County, Colorado, to almost an increase of one-third of the total in Dolores County, Colorado. This increase may be somewhat misleading since very little infrastructure or tax receipts in Dolores County exist at the present.

The housing demand by type of housing is presented in Table 4.7-32. The distribution of the demand for each type of housing by individual cities and counties is presented in Table 4.7-32. The demand for all types of housing will not be met in Dolores County, Colorado. Demand exceeds supply by over 600 percent and in the case of RV spaces, no supply exists. This problem will be rectified by the use of work camps or commuting from Durango and Cortez where sufficient supply of motels and RV spaces exists. The demand for rental units exceeds supply in Cortez, Moab, Kemmerer, and Evanston. This will result in a shift in demand to other housing types or other locations. The excess demand in Cortez will most likely shift to Durango. The shortfall in Moab could shift to Grand Junction which is between 20 and 40 miles farther away from the various loops. Evanston is approximately 52 miles from the Opal Station, while Rock Springs and Green River are both approximately 70 miles away. It is logical to expect a shift of the excess demand in Evanston to these two other cities. Excess demand in Kemmerer could also shift to Rock Springs and Green River. This will be necessary for the demand for RV spaces in the Kemmerer area, since no supply is reported to exist.

It should be noted that the data presented in Table 4.7-32 are reasonably recent but may not entirely reflect the declines in economic activity from the current depression in the oil and gas development industry. The depression would result in increased vacancies and greater availability of accommodations for the work force associated with any of the proposed projects.

4.7.3.8.2 Traffic

Refer to the introductory paragraphs in Section 4.2.8.2 for significance criteria. Due to the close proximity of the ROW and State Highway 139 through Douglas Pass and the many crossings, there may be some traffic flow delays when equipment is moved. It is not anticipated, however, that delays in any one location will last more than one week since construction will move southward.

4.7.3.8.3 Noise

Section 4.2.8.3 details the general construction noise levels which would occur during the construction of the loops needed by the Northwest project. Increased noise levels associated with

Table 4.7-31

CONTRIBUTION TO COUNTY TAX BASE, NORTHWEST EXPANSION PROJECT

State/County	Length of Line (miles) Facilities	Estimated Taxable Value of Pipeline and Facilities (Millions)	Total 1984/1985 County Assessed Value (Millions)	Pipeline Percentage of Total Value	1984/1985 County Tax Revenues (Millions)
COLORADO					
Dolores	1.4 Cahone Station	$ 6.7	$ 20.6	32.48%	$ 1.5
Garfield	16.0	11.7	279.8	4.17	17.7
La Plata	Ignacio Station	0.3	250.7	0.11	18.3
Mesa	1.7	1.2	452.8	0.27	38.9
Montezuma	14.8	10.8	119.8	9.01	9.5
Rio Blanco	29.2	21.3	391.7	5.44	19.6
UTAH					
Grand	30.0 Cisco Station	27.6	72.8	37.85	3.7
San Juan	30.2	22.0	181.6	12.13	10.0
WYOMING					
Lincoln	18.5	13.5	297.1	4.54	20.3
Sweetwater	20.1 Green River Station	14.9	1,147.4	1.30	84.4

SOURCE:

The total cost of the project is expected to be $130,000,000 [Section 2.8.1.3]. The two new compressor stations are assumed to cost $5,669,000 each based on the Topock Compressor in the Mohave project. Expansion of compressor power is assumed to cost $272,000 based on El Paso Natural Gas Company, [1985]. The costs of these facilities were subtracted from the total project cost and the difference allocated to each county based on the mileage of pipeline to be constructed in that county. Local tax data were obtained from various local government agencies.

Table 4.7-32

HOUSING DEMAND DISTRIBUTION BY AFFECTED AREA, NORTHWEST EXPANSION PROJECT

	Temporary Housing									
	Hotel/Motel Rooms			Rental Units			RV Spaces			
State/County/City	Supply	Demand	%	Supply	Demand	%	Supply	Demand	%	Permanent Housing
COLORADO										
Dolores	22	155	705	17	100	588	0	97	[2]	45
Garfield	1,300	110	8	308	71	23	414	69	17	530
La Plata	2,785	30	1	234			496	10	2	388
Durango	1,393	15	1	50	28	56	894	19	2	82
Mesa				840						1,587
Grand Junction	2,000	110	6	304	71	23	216	69	32	574
Montezuma				125			63	12	19	228
Cortez	700	110	16	50	71	143	301	57	19	90
Rio Blanco	70 [1]	41	59	64			163	69	42	110
Rangely	120	59	49	n/a	71	n/a	0	0	0	n/a
UTAH										
Grand				75						118
Moab	491	155	32	46	100	217	311	97	31	73
San Juan	268	110	41	95	71	75	77	69	90	152
WYOMING										
Lincoln	500	78	16	133						167
Kemmerer	204	32	16	43	71	164	0	69	[2]	54
Sweetwater				388			192	48	25	538
Green River	165	13	8	100	27	27	55	14	25	138
Rock Springs	1,249	142	11	188	73	39	140	35	25	261
Uinta	96	8	8	139			72	53	74	163
Evanston	1,255	102	8	66	71	108	22	16	73	77

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[1] Additional rooms and RV spaces in the county near the ROW.
[2] Infinite percentage resulting from division by zero.

SOURCES: Hotel/Motel supply derived from Affected Environment Sections. Rental Units supply is calculated as those units for rent. Year-round supply is calculated as those units for rent or sale. Units listed as vacant awaiting occupancy or demolition, held for occasional use, or boarded up were not included. Due to a lack of data on rental unit or year round unit available housing supply for individual cities, the relationship between the numbers of these types of units and total housing units in the county in which the city exists was used to adjust total vacant units in each individual city.

construction would be short-term. Since the majority of the loops would be constructed in rural areas, during daylight hours, the impacts from construction related noise would not be considered significant.

Noise-related impacts in the vicinity of the northern end of the Moab Loop would be greater than in other portions of the route because construction occurs in or adjacent to residential areas.

Noise levels at the Cisco and Cahone Compressor Station sites would be increased due to construction for approximately eight months. A survey of existing noise levels at the two sites would be made prior to commencement of construction. Due to the rural locations of the construction and operation, noise should not represent a significant impact.

Sound level data for the compressor units at Cisco and Cahone will not be available until the compressor equipment has been selected.

4.7.3.8.4 Recreational Resources

Since there are no designated recreational sites within the mile-wide study corridor for all loops, no potential impacts are expected. Areas which might experience some traffic congestion include the main paved road through Arches National Park (Cisco Loop) and the access to the McPhee Recreational Complex (Cahone Loop). There may be some competition for campground spaces at Flaming Gorge National Recreational Area (Green River Loop), Arches National Park (Cisco Loop), and at McPhee Reservoir (Cahone Loop). Arches National Park will also be subjected to temporary impacts caused by construction of the Cisco Loop. These would include dust and noise during construction and visual impacts. Due to the excess of supply over demand in Grand Junction, Cortez, and Moab for both motel rooms and RV spaces, the extent of this competition is expected to be minimal.

4.7.3.9 Land Ownership/Use

Land use impacts will be assessed according to the degree of conflict between the routing and existing land uses or policies regarding land use.

The Muddy Creek and Green River~~, and Cisco~~ Loops have no identified land use conflicts. The westernmost end of the Cisco Loop could conflict with the Lost Springs Wilderness Study Area which is a proposed portion of Arches National Park. Major routing conflicts will exist on Rangely Loops A and B with the three natural gas transmission pipelines and Highway 139 in this narrow, unstable corridor.

The mile of irrigated agriculture that Rangely Loop A traverses should not be disturbed for over one growing season, and therefore the impact is short-term.

The half mile of commercial timbering in the Rangely Loop B would be a long-term impact because it would be taken out of production for the life of the project.

The Moab Loop has 1.5 miles of residential/commercial area in the Spanish Valley could be impacted long-term if the pipeline traverses within 100 feet of any homes.

The entire Cahone Loop traverses rough grazing land and non-irrigated agricultural land used to grow pinto beans and grains. There is a potential impact to lands that will be irrigated in the future by the Dolores/McPhee Project. If cropland is taken out of production, it would be a long-term impact.

No land use impacts are anticipated at the compressor stations.

Table 4.7-33 shows the number of acres that would be disturbed for each loop by land ownership category. Table 4.7-34 shows the number of acres that would be disturbed for each loop by land use category.

4.7.3.10 Cultural Resources

4.7.3.10.1 Archaeology

Muddy Creek Loop. Twenty-six known sites are located within the zone of direct impact. They include ten lithic scatters (one which has been destroyed), and fourteen sites containing lithics associated with fire altered rock or a hearth feature (and occasionally ceramics and/or groundstone). Other sites include a quarry and an historic sheep camp which has been destroyed. Finally, the California Emigrant Trail crosses the direct impact zone. If it has integrity at this point, it would be of National Register status. About 8.4 percent of the direct impact zone has been surveyed and perhaps another 70 percent has close to complete coverage.

Seventeen known sites fall within the zone of indirect impact. Eleven are artifact scatters composed of lithics and/or ceramics or groundstone. Five other scatters contain fire altered rock or a hearth. The last site is an historic sheep camp with associated historic trash.

Green River Loop. A single known site, a lithic scatter, is located in the zone of direct impact; however, no surveys have been conducted.

There are no documented sites in the zone of indirect impact.

Table 4.7-33

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, NORTHWEST EXPANSION PROJECT

Pipeline Component	County, State	Disturbance Area	Total Acres	Private Acres	BLM Acres	State Acres
Muddy Creek	Lincoln, WY	60' Construction	135.3	64.0	66.9	4.4
		45' Operation	101.5	48.0	50.2	3.3
	Sweetwater, WY	60' Construction	116.4	63.3	49.5	3.6
		45' Operation	87.3	47.5	37.1	2.7
Subtotal		60' Construction	251.6	127.3	116.4	8.0
		45' Operation	188.7	95.5	87.3	6.0
Green River	Sweetwater, WY	60' Construction	29.8	10.2	19.6	-
		45' Operation	22.4	7.6	14.7	-
Rangely A	Rio Blanco, CO	60' Construction	214.5	41.5	173.1	-
		45' Operation	160.9	31.1	129.8	-
	Garfield, CO	60' Construction	9.5	9.5	-	-
		45' Operation	7.1	7.1	-	-
Subtotal		60' Construction	224.0	50.9	173.1	-
		45' Operation	168.0	38.2	129.8	-
Rangely B	Garfield, CO	60' Construction	105.5	29.8	75.6	-
		45' Operation	79.1	22.4	56.7	-
	Mesa, CO	60' Construction	12.4		12.4	-
		45' Operation	9.3		9.3	-
Subtotal		60' Construction	117.8	29.8	88.0	-
		45' Operation	88.4	22.4	66.0	-
Cisco	Grand, UT	60' Construction	186.9	5.8	144.0	37.1
		45' Operation	140.2	4.4	108.0	27.8
Moab	Grand, UT	60' Construction	31.3	13.8	1.5	16.0
		45' Operation	23.5	10.4	1.1	12.0
	San Juan, UT	60' Construction	221.8	36.4	120.0	65.5
		45' Operation	166.4	27.3	90.0	49.1
Subtotal		60' Construction	253.1	50.2	121.5	81.5
		45' Operation	189.8	37.6	91.1	61.1
Cahone	Dolores, CO	60' Construction	10.2	10.2	-	-
		45' Operation	7.6	7.6	-	-
	Montezuma, CO	60' Construction	108.4	108.4	-	-
		45' Operation	81.3	81.3	-	-
Subtotal		60' Construction	118.5	118.5	-	-
		45' Operation	88.9	88.9	-	-
Total		60' Construction	1181.8	392.7	662.5	126.5
		45' Operation	886.4	294.5	496.9	94.9

Table 4.7-34

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE, NORTHWEST EXPANSION PROJECT

Pipeline Component	County, State	Disturbance Area	Total Acres	Grazing/ Rangeland Acres	Timber/ Forest Acres	Irrigated Non-Irrigated Agriculture Acres	Commercial/ Industrial
Muddy Creek	Lincoln,	60' Construction	251.6	251.6	-	-	-
	Sweetwater, WY	45' Operation	188.7	188.7	-	-	-
Green River	Sweetwater, WY	60' Construction	29.8	29.8	-	-	-
		45' Operation	22.4	22.4	-	-	-
Rangely A	Rio Blanco, CO	60' Construction	224.0	216.7	-	7.3	-
	Garfield, CO	45' Operation	168.0	162.5	-	5.4	-
Rangely B	Garfield, CO	60' Construction	117.8	114.2	3.6	-	-
	Mesa, CO	45' Operation	88.4	85.6	2.7	-	-
Cisco Loop	Grand, UT	60' Construction	186.9	186.9	-	-	-
		45' Operation	140.2	140.2	-	-	-
Moab Loop	Grand, UT	60' Construction	253.1	242.2	-	-	10.9
	San Juan, UT	45' Operation	189.8	181.6	-	-	8.2
Cahone Loop	Dolores, CO	60' Construction	118.5	-	-	118.5	-
	Montezuma, CO	45' Operation	88.9	-	-	88.9	-
TOTAL		60' Construction	1181.8	1041.5	3.6	125.8	10.9
		45' Operation	886.4	781.1	2.7	94.4	8.2

Rangely Loop A. This loop passes through the Canyon Pintado Archaeological District which has been ~~nominated to~~ listed on the National Register. All but ~~one~~ two of the 17 known sites which fall into the zone of direct impact belong to this archaeological district. They include three lithic scatters, a lithic-groundstone scatter, a hearth site, five rockshelter sites (including one with granaries and two with petroglyphs), and six petroglyph sites, and a site composed of historic trash. One of the rockshelter sites is listed on the National Register. One of the lithic sites has been destroyed. About 71.6 percent of the direct impact zone has been surveyed.

A total of 38 known sites are located in the zone of indirect impact. They include 11 petroglyph sites, 10 rockshelter sites (associated with such features as hearths, petroglyphs, granaries or honing surfaces), eight campsites with lithics and/or hearths, a prehistoric structure with petroglyphs, bin and honing surface, and five lithic scatters. Other sites include a wickiup with hearth and lithics, two historic foundations, and an isolated honing surface. All but three of these sites are located in the Canyon Pintado Archaeological District which has been ~~nominated to~~ listed on the National Register. Two of the rockshelter sites are listed on the National Register. One of these is a Fremont site with a structure, petroglyphs and midden.

Rangely Loop B. ~~Five~~ Six known sites fall within the zone of direct impact: a petroglyph site, a lithic-ceramic scatter, a lithic-ceramic-groundstone scatter, a hearth site with lithics and bone, and an historic Anglo (?) corral. About 73.5 percent of the direct impact zone has been surveyed.

Nine known sites are situated in the zone of indirect impact. They include a rock alignment, a petroglyph site, ~~two~~ one rockshelter, two probable hearth sites with associated lithics, a camp, a lithic scatter, and an isolated find.

Cisco Loop. Nine known sites are situated in the zone of direct impact. They include a quarry site, two rockshelters, four lithic scatters, a camp and a lithic-ceramic scatter. The entire direct impact zone has been surveyed.

Three known sites fall within the zone of indirect impact. All three are lithic scatters.

Cisco Compressor Station. No known sites are located in the area. ~~proposed for this station.~~

Moab Loop. A total of ~~37~~ 36 known sites are located in the direct impact zone. They include ~~26~~ 25 lithic scatters, ~~three~~ four camps with lithics, and four camps with lithics and groundstone. Other sites include a quarry site, a rockshelter and an historic road. About 3.6 percent of the direct impact zone has been surveyed and perhaps another 50 percent has close to complete coverage.

A total of ~~24~~ 25 known sites fall in the zone of indirect impact. They include ~~16~~ 17 lithic scatters, ~~six~~ four campsites with lithics, a check dam, ~~and a quarry~~ two quarries, and a historic kiln.

Cahone Loop. This loop passes through part of the Anasazi Archaeological District which has been ~~nominated to~~ listed on the National Register. Thirty-four other sites fall within the zone of direct impact. They include three lithic scatters, 15 campsites, nine structures with roasting pits, three structures with middens, an historic structure with a cistern, a rock cairn and an historic irrigation canal which twice crosses the proposed pipeline. One of the structures with associated roasting pit and the cairn site have been determined to be ineligible for the National Register. About 96.7 percent of the direct impact zone has been surveyed.

Eleven sites are located in the zone of indirect impact. They include a pithouse, five campsites, and four sites with structures and associated roasting pits. One of the campsites dating to the Pueblo II period and another dating to the Basketmaker II and III, and Pueblo I and II, periods, have been determined to be eligible for the National Register. One site in this zone is located within the Anasazi Archaeological District which has been nominated to the National Register.

Cahone Compressor Station. Two sites are located within the location proposed for this station and are thus in the zone of direct impact. They include a camp site and a structure with associated roasting pit. Those two sites have already been noted within the Cahone Loop above.

All Loops. A total of ~~133~~ 132 known cultural resources are located in the zone of direct impact of the Northwest expansion loops. Another ~~102~~ 103 cultural resources are located in the zone of indirect impact. The Rangely A and Cahone Loops pass through archaeological districts that have been ~~nominated to~~ listed on the National Register. In the zone of direct impact, one site is listed on the National Register and five have been determined not to be eligible (three because they are destroyed). In addition, an historic trail would be of National Register status if it has integrity where it crosses the pipeline. In the zone of indirect impact, two sites are listed on the National Register and two others have been determined to be eligible for the Register. About 49.1 percent of the direct impact zone has been surveyed and perhaps another 24 percent has close to complete coverage.

There are three very high sensitivity pipeline segments along the Muddy Creek, Rangely A, and Cahone Loops. There are two high sensitivity pipeline segments along the Rangely B and Moab Loops.

4.7.3.10.2 American Indian Concerns

The Ute Indian tribe (Ute Tribal Museum in Duchesne, Utah) is concerned about impacts to ancestral sites, burials, and traditional plant and animal species situated along the proposed expansion loops. See Section 3.6.3.10.2.

4.7.3.11 Paleontological Resources

Six fossil localities occur within the corridor of the Northwest loops. Table 4.7-35 lists the impact mileages broken down by impact rating and by separate loop routes.

A detailed breakdown of the geological formation, the fossils present, and the milepost locations of the formations have been discussed in the Paleontological Resources Technical Report [Morales, et al. 1987].

Table 4.7-35

PALEONTOLOGICAL FORMATIONS IMPACT MILEAGES,
NORTHWEST EXPANSION PROJECT

Loop Name	Total Route Miles	Impact Mileages Undetermined		
		Undetermined	Insignificant	Significant
Muddy Creek	34.6	0.0	2.2	32.4
Green River	4.1	0.0	0.0	4.1
Rangely A	30.8	2.3	0.0	28.5
Rangely B	16.2	0.0	7.1	9.1
Cisco	25.7	0.0	3.7	22.0
Moab	34.8	0.0	24.9	9.9
Cahone	16.3	0.0	11.8	4.5

4.7.3.12 Visual Resources

Refer to Section 4.2.12 for impact methodology and Table 4.7-36 for a summary of visual impacts.

Muddy Creek Loop

MP 424.3-411.3, VRM/VQO: BLM Class III
Description: This segment of the route parallels a wash area and the existing Northwest pipeline and is highly visible from U.S. 30. It would, however, create a low visual impact due to the many existing modifications in the area. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Table 4.7-36

SUMMARY OF VISUAL IMPACTS, NORTHWEST EXPANSION PROJECT

Milepost	Loop	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	Visual Impacts (Miles)			
						High 1/	Moderate 1/	Low	None
437.3-424.3	Muddy Creek	BLM	Grasslands	IV	US Rte 30 & Hwy 240	-	-	-	x
424.3-411.3	Muddy Creek	BLM	Wash Area	III	US Rte 30 & Railroad	-	-	13.0	
411.3-402.8	Muddy Creek	BLM	Foothills	IV	US Rte 30	-	-	-	x
391.7-387.6	Green River	BLM	Foothills	III	Hwy 530	-	-	4.1	
239.9-229.3	Rangely B	BLM	Trail Canyon/ Grand Valley	III	Hwy 139	-	-	10.6	
229.3-223.7	Rangely B	BLM	Trail Canyon/ Grand Valley	IV	US Rtes 6 & 50	-	-	-	x
277.7- 246.9	Rangely A	BLM	Douglas Creek	III	Hwy 139 & Ranches	-	-	30.0	
195.6-169.9	Cisco	BLM	Foothills	IV	US Rtes 128 & 50	-	-	-	x
145.1-144.6	Moab	BLM	Spanish Valley	III	US Rte 163	-	-	0.5	
144.1-143.6	Moab	BLM	Spanish Valley	III	US Rte 163	-	-	0.5	
136.8-136.3	Moab	BLM	Spanish Valley	III	US Rte 163	-	-	0.5	
135.8-134.1	Moab	BLM	Behind the Rocks	III	US Rte 163	-	-	1.7	
132.8-130.8	Moab	BLM	Kane Springs	II	US Rte 163	-	2.0	-	
130.8-129.0	Moab	BLM	Flat Iron Mesa	III	US Rte 163	-	-	1.8	
126.2-125.5	Moab	BLM	Flat Iron Mesa	III	US Rte 163	-	-	0.7	
123.7-123.2	Moab	BLM	Looking Glass Rock	III	US Rte 163	-	-	0.5	
122.2-121.1	Moab	BLM	Dry Valley	III	US Rte 163	-	-	1.1	
120.3-199.5	Moab	BLM	Dry Valley	III	US Rte 163	-	-	0.8	
117.8-113.4	Moab	BLM	Dry Valley	III	US Rte 163	-	-	4.4	
111.8-110.8	Moab	BLM	Dry Valley	III	US Rte 163	-	-	1.0	
67.9-51.6	Cahone	Private	Agricultural lands	N/A	Us Rte 163	-	-	-	x
					TOTAL (Miles) OF VISUAL IMPACTS	0.0	2.0	71.20	

1/Significant Impacts

Green River Loop

MP 391.7-387.6, VRM/VQO: BLM Class III
Description: This segment of the route through the foothills of Black Mountain follows the existing Northwest pipeline, and would create a low visual impact. The route would be visible to motorists on Highway 530. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Rangely Loop B

239.9-229.3, VRM/VQO: BLM Class III
Description: This segment of the loop which parallels Highway 139 and passes between Books Cliffs would create a low visual impact because of existing modifications. The pipeline would be visible to motorists along Highway 139 which follows the pipeline route and private ranches in the area. The proposed route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Rangely Loop A

MP ~~261.9~~ 277.7-246.9, VRM/VQO: BLM Class III
Description: This segment of the route through Douglas Creek Canyon parallels Douglas Creek alongside the existing Northwest pipeline, and would create a low visual impact because of existing modifications. The pipeline would be visible from Highway 139 which follows the pipeline route and private ranches in the area. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Moab Loop

MP 145.1, VRM/VQO: BLM Class III
Description: This segment of the route through the Spanish Valley parallels the existing Northwest pipeline and U.S. Route 163 and the loop would create a low visual impact because of existing modifications. The pipeline would be visual to motorists on U.S. Route 163 and from the town of Moab. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 144.1-143.6, VRM/VQO: BLM Class III
Description: This segment of the route through the Spanish Valley parallels the existing Northwest pipeline and U.S. Route 163 and the loop would create a low visual impact because of existing modifications. The pipeline would be visible to motorists on U.S. Route 163 and from the town of Moab. The route

would experience slow revegetation and long-term recovery rate is anticipated. These impacts are not significant.

MP 136.8-136.3, VRM/VQO: BLM Class III
Description: This segment of the route through the Spanish Valley parallels the existing Northwest pipeline and U.S. Route 163 and the loop would create a low visual impact because of existing modifications. The pipeline would be visible to motorists of U.S. Route 163 and from the town of Moab. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 135.8-134.1, VRM/VQO: BLM Class III
Description: This segment of the route passes through Behind the Rocks (Spanish Valley), a visually significant area; however, the loop would create a low visual impact because of existing modifications. The pipeline would be visible from Highway 139, which parallels the route. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

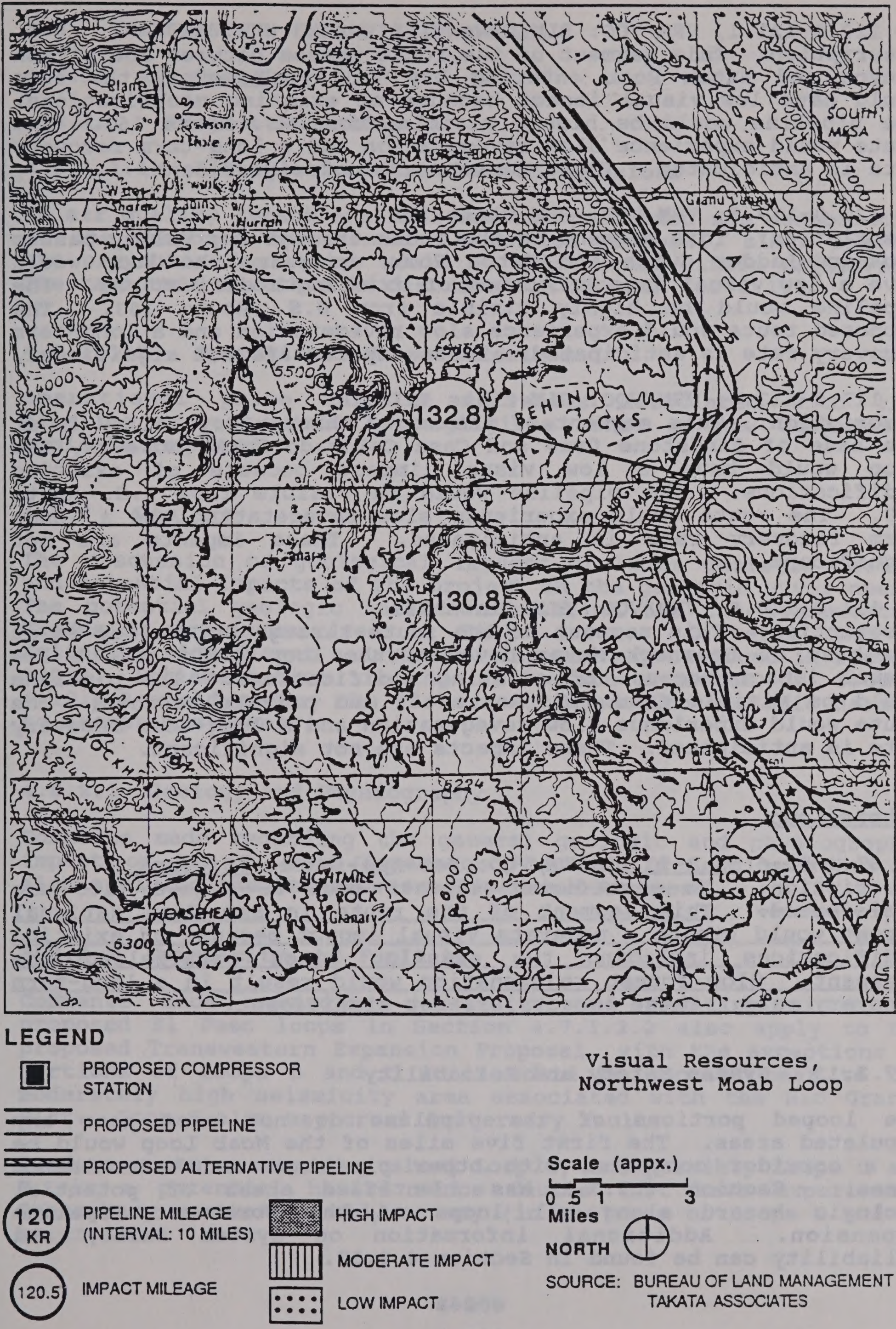
MP 132.8-130.8, VRM/VQO: BLM Class II
Description: This segment of the route crosses Kane Springs and passes through a narrow gorge defined by Bridger Jack Mesa. Although the pipeline would be highly visible from U.S. Route 163 because of the narrowness of the gorge, it would have moderate visual impact because of existing modifications. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are significant (Figure 4.7-5).

MP 130.8-129.0, VRM/VQO: BLM Class III
Description: This segment of the route through the Flat Iron Mesa area would have a low visual impact because of existing modifications. The pipeline loop would be highly visible from U.S. Route 163. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 126.2-125.5, VRM/VQO: BLM Class III
Description: This segment of the route is near the end of the Flat Iron Mesa area and the loop would have a low visual impact because of existing modifications. The pipeline would be highly visible from U.S. Route 163. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 123.7-123.2, VRM/VQO: BLM Class III
Description: This segment of the route is at the base of Looking Glass Rock, and would have a low visual impact because of existing modifications. The pipeline would be highly visible from U.S. Route 163. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Figure 4.7-5


SOUTH MESA
Blane Water
Jackson Hole
Water Shafer Basin
Hurrah Pass
Grand 4934
6000
7000
5500
5000
4000
132.8
BEHIND THE ROCKS
130.8
6224
8100
6000
5900
4
2
EIGHTMILE ROCK
Granary
HORSEHEAD ROCK
6300
LOOKING GLASS ROCK
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
Scale (appx.)
0 .5 1 3
Miles
NORTH

Visual Resources, Northwest Moab Loop

SOURCE: BUREAU OF LAND MANAGEMENT
TAKATA ASSOCIATES

MP 122.2-121.1, VRM/VQO: BLM Class III
Description: This segment of the route passes between Joe Wilson Canyon and Hatch Rock entering Dry Valley; however, the loop would have low visual impact because of existing modifications. The pipeline would be highly visible from U.S. Route 163. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 120.3-119.5, VRM/VQO: BLM Class III
Description: This segment of the route through Dry Valley passes Hook-and-Ladder Gulch and Hatch Rock; however, the loop would have a low visual impact because of existing modifications. The pipeline would be highly visible from U.S. Route 163. The proposed route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 117.8-113.4, VRM/VQO: BLM Class III
Description: This segment of the route through Dry Valley is at the base of Sandstone Draw and Casa Colorado Rock; however, the loop would have a low visual impact because of existing modifications. The pipeline would be visible from U.S. Route 163. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

MP 111.8-110.8, VRM/VQO: BLM Class III
Description: This segment of the route through Dry Valley is at the base of Deerneck Mesa; however, the loop would have a low visual impact because of existing modifications. The pipeline would be visible from U.S. Route 163 and private ranches. The route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant.

Cahone Loop

MP ~~67.9-51.6~~ 52.3-51.6, VRM/VQO: ~~Not Applicable~~ FS Class R
Description: ~~No significant impacts from US Highway 163 are anticipated.~~ This segment of the route in San Juan National Forest would create a moderate visual impact because of existing modifications including two existing lines paralleling the easement. Slow forest rejuvenation would result in a long-term recovery rate. These impacts are not significant.

4.7.3.13 System Safety and Reliability

The looped portions of the pipeline do not pass near any populated areas. The first five miles of the Moab Loop would be in a corridor congested with other pipelines and transmission lines. Section 4.7.3.2 has identified areas of potential geologic hazard along all loops of the Northwest Pipeline Expansion. Additional information on system safety and reliability can be found in Section 4.2.13.

4.8 TRANSWESTERN EXPANSION PROPOSAL

4.8.1 Air Quality

4.8.1.1 Project Emissions

4.8.1.1.1 Installation/Construction Emissions

An air quality impact analysis was not performed for construction of the proposed Transwestern Expansion Proposal, since none of the project's facilities would be constructed within California. The rationale for this is discussed in Section 4.2.1.1.1.

4.8.1.1.2 Operational Phase Emissions

Operational phase emission increases associated with this pipeline project would be negligible since no new compressors would be required.

4.8.2 Geology

The discussion of geological impacts includes geologic hazards and potential impacts of the project on the geologic environment. The potential geologic hazards identified for the Transwestern Expansion are summarized in Table 4.8-1. Criteria used to delineate significant hazards and impacts may be found in Section 4.2.2. Implementation of the mitigation measures in Section 4.10.4.2 would reduce the risks associated with geologic hazards to acceptable levels.

4.8.2.1 Geology and Physiography

Comments made regarding the general geologic and physiographic impact of the El Paso Expansion Proposal in Section 4.7.1.2.1 also apply to the Transwestern Expansion Proposal.

4.8.2.2 Seismicity and Faulting

Comments made regarding seismicity and faulting along the proposed El Paso loops in Section 4.7.1.2.2 also apply to the proposed Transwestern Expansion Proposal, with the exceptions of portions of Loops B and C which would be located near to the moderately high seismicity area associated with the Rio Grande Rift. Loop H also may cross Quaternary faults.

Surface rupture occurring along Loop C, and possibly Loops G and H, is a potential hazard since faults that have experienced Quaternary movement would, or may (in the case of Loops G and H) be crossed.

Table 4.8-1

SIGNIFICANT GEOLOGIC HAZARDS, TRANSWESTERN EXPANSION PROPOSAL

Milepost	Loop	Liquefaction/ Ground Failure	Surface Fault Rupture	Slope Instability	Ground Subsidence
West Texas Lateral					
0-4.1	1	-	-	-	X
77.5-88.0	2	-	-	-	X
Transwestern Mainline					
29.0-55.0	A	-	-	-	X
86.6-131.3	B	-	-	-	-
173.3-200.5	C	X	X	-	-
179	C	-	-	X	-
224.0-271.3	D	-	-	-	-
303.3-310	E	-	-	-	X
316	E	-	-	-	-
316.0-340.8	E	-	-	-	X
375.3-416.8	F	-	-	-	-
449.0-485.5	G	-	(?)	-	-
462.0-470.0	G	-	-	X	-
526.8-576.3	H	-	(?)	-	-
613.0-644.5	I	-	-	-	-
623.0-632.0	I	-	-	X	-

(?) Major Quaternary faults nearby. Further study needed to determine if ROW crosses any.

Such faults have the potential to cause both strong ground shaking and rupture of the pipeline. Loop B does not cross known Quaternary faults, but it terminates near to the east boundary of the Rio Grande Rift, which could be a source of strong ground shaking. The effects of strong ground shaking on the various project facilities depend on their design parameters. The buried pipeline would be relatively insensitive to vibratory shaking, because it is flexible enough to deform somewhat with the surrounding soil.

Secondary seismic effects triggered by strong ground shaking can be more serious than the shaking itself. Soil liquefaction, with or without spreading, can occur in unconsolidated, generally low bulk-density, saturated soils subjected to moderate to strong ground shaking could damage the pipeline. Alluvial and eolian deposits along the proposed Loop C may be susceptible to these effects where the groundwater table is high.

Moderate to strong ground shaking can trigger renewed movement or enlargement of existing landslides and induce new failures. Locally steep slopes along the proposed Loops B and C could be susceptible to failure from seismic shaking.

4.8.2.3 Slope Stability

Comments made in Section 4.7.1.2.3 regarding rockfalls and slope stability along steep canyon walls crossed by the proposed El Paso Loops also apply to the proposed Transwestern Loops, with the following exceptions:

Loop C. A large landslide of unknown age or activity occurs immediately to the southwest of Loop C at MP 179. Trench excavation or seismic shaking might trigger renewed movement perhaps causing a slide mass to override and possibly crush the pipeline.

Loop G. Slope stability problems already exist along Elden Mountain and the western part of Loop G (MP 462-465). Construction in high relief sections could create new unstable slopes.

Loop I. Numerous rockfalls and tight construction conditions occur along the route through the Black Mountains area.

4.8.2.4 Subsidence

~~Moderate-to-high~~ Low subsidence hazards exist along the route of proposed Loop A due to the karstification of the underlying San Andres limestone. ~~Construction of Loop A could increase solutioning of the limestone and increase the potential for sinkhole development.~~ Subsidence potential due to the removal of coal within the San Juan Basin of northwestern New Mexico ~~could~~

~~have-a-significant-impact~~ does not appear to be significant on Loop E (MP 303.3-310). ~~Also,-subsidence-could-be-severe-in-the vicinity--of~~ However, the New Mexico Potash Company, Inc. underground workings could have a significant impact on the route if existing or abandoned workings subsequently collapsed. ~~mine due-to-the-underground-extraction-of-potash.~~ Implementation of applicable mitigation measures identified in Section 4.10.6 of Volume I and Section 3.1.17 of Volume III would minimize the subsidence hazard.

4.8.2.5 Unique Geologic Features and Flooding

Comments made in Sections 4.7.1.2.5 and 4.7.1.2.6 regarding unique geologic features and flash flooding along the proposed El Paso Loops also apply to the proposed Transwestern Loops.

4.8.2.7 Mineral/Petroleum Resources

Comments made in Section 4.7.1.2.7 regarding mineral resources along the proposed El Paso Loops also apply to the proposed Transwestern Loops.

4.8.3 Soil

Impacts to soils that could result from construction of the proposed pipeline are classified as significant or not significant based on the degree of impact as measured against scientific criteria. The criteria that follow are derived from regulatory standards, research information, and/or other standards based on best professional judgement of resource specialists. Refer to Section 4.2.3 for criteria used to delineate significant impacts as well as a general discussion on impacts that could occur to soils due to pipeline construction. Distribution of potential impacts is summarized in Table 4.8-2. Refer to Appendix A-4 for more information on soils along the route of this proposed expansion.

Loop 1. The probability for significant water erosion along the route of this proposed expansion is low, and the probability for significant wind erosion is evenly distributed from low to high. Reclamation potential is poor, indicating potential for significant revegetation problems.

Loop 2. The probability for significant water erosion is low along the route of this proposed expansion and the probability for significant wind erosion ranges from moderate to high, but is mostly high. Reclamation potential is poor, indicating potential for significant revegetation problems.

Table 4.8-2

DISTRIBUTION OF POTENTIAL SOIL IMPACTS, TRANSWESTERN EXPANSION PROPOSAL

		Erosion Potential 1/						Reclamation Potential 2/		
		Water (miles) 3/			Wind (miles) 3/			(miles) 3/		
Milepost	Geographic Area	L	M	H	L	M	H	G	F	P
0.0-4.1	Loop 1 Great Plains	4.1	0.0	0.0	1.8	1.0	1.3	0.0	0.0	4.1
77.5-88.0	Loop 2 Great Plains	10.5	0.0	0.0	0.0	2.5	8.0	0.0	0.0	10.5
29.0-55.0	Loop A Great Plains	10.0	10.0	6.0	9.0	17.0	0.0	8.0	0.0	18.0
86.6-131.3	Loop B Basin & Range	29.7	12.0	3.0	14.7	28.0	2.0	17.0	15.0	12.7
173.3-200.5	Loop C Basin & Range	22.7	4.0	0.5	10.2	17.0	0.0	7.0	9.2	11.0
224.0-271.3	Loop D Colorado Plateau	24.5	22.8	0.0	14.3	23.0	10.0	4.0	21.3	22.0
303.3-340.8	Loop E Colorado Plateau	22.0	8.5	7.0	0.0	37.0	0.5	9.0	16.0	12.5
375.3-416.8	Loop F Colorado Plateau	32.0	5.5	4.0	13.0	28.5	0.0	13.0	15.0	13.5
449.0-485.5	Loop G Colorado Plateau	18.5	18.0	0.0	30.5	6.0	0.0	2.0	20.5	14.0
526.8-576.3	Loop H Colorado Plateau	32.7	11.2	5.6	41.3	8.2	0.0	16.8	10.8	21.9
613.0-644.5	Loop I Mojave Desert	24.5	5.0	2.0	14.0	14.0	3.5	9.0	0.0	22.5

1/ Water Erosion Potential

L(low) = less than 5 tons/acre/year (low probability for significant erosion impacts).

M(moderate) = 5 to 20 tons/acre/year (near even probability for significant erosion impacts).

H(high) = greater than 20 tons/acre/year (high probability for significant erosion impacts).

Wind Erosion Potential

L(low) = low probability for significant erosion impact.

M(moderate) = near even probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

H(high) = high probability for significant erosion impacts. Impact potential also dependent upon site specific exposure to prevailing winds.

2/ Reclamation Potential

Ratings are based upon trenching with no selective soil handling or other mitigation.

G(good) = good probability for restoring vegetation which will support pre-existing land use. Productivity potential may be somewhat reduced.

F(fair) = near even probability for restoring vegetation which will support pre-existing land use within short periods of time. Time needed for reestablishment is likely to be longer than soils with good potential. Productivity potential may be reduced.

P(poor) = low probability for restoring vegetation which will support pre-existing land use within a short period of time. Time needed for reestablishment is likely to be long. Productivity potential may be reduced.

3/ Cumulative miles for pipeline segment.

Loop A. The probability for significant water erosion is distributed evenly from low to high along this section of the proposed route, with segments on steeper slopes having high probabilities. The potential for significant wind erosion is low and moderate. Reclamation potential is good and poor, but predominantly poor indicating potential for significant revegetation problems.

Loop B. The potential for significant water erosion along this section of the proposed route is mostly low and moderate. The potential for significant wind erosion is evenly distributed across the low to moderate range. Reclamation potential is evenly distributed from good to poor, indicating about one-fourth to one-third of the loop would have significant revegetation problems.

Loop C. The potential for significant water erosion along this section of the proposed route is mostly low. The potential for significant wind erosion is low and moderate. Reclamation potential is mostly poor, but ranges from poor to good, indicating sizeable segments of the loop would have significant revegetation problems.

Loop D. The potential for significant water erosion along this section of the proposed route is low and moderate. The potential for significant wind erosion is mostly low and moderate, with a lesser amount having a high potential. Reclamation potential is mostly fair and poor, indicating that sizeable segments would have significant revegetation problems.

Loop E. The probability for significant water erosion along this section of the proposed route is mostly low, with a lesser amount having moderate and high probabilities on steeper slopes. The probability for wind erosion is mostly moderate. Reclamation potential is dominantly fair and poor, indicating that sizeable segments would have significant revegetation problems.

Loop F. The probability for significant water erosion along this section of the proposed expansion is mostly low, with a lesser amount having moderate and high probability on steeper slopes. The potential for significant wind erosion is mostly moderate, but ranges from low to moderate. Reclamation potential is evenly distributed across the good to poor range, indicating that about one-third of the loop would have significant revegetation problems.

Loop G. The probability for significant water and wind erosion along this section of the proposed expansion is low and moderate. Reclamation potential is mostly fair and poor, indicating that about one-half of this loop would have significant revegetation problems.

Loop H. The probability for significant water and wind erosion along this section of the proposed expansion is mostly low to moderate. Reclamation potential ranges from poor to good, but mostly poor, indicating that about one-third to one-half of the loop would have significant revegetation problems.

Loop I. The probability for significant water erosion along this section of the proposed route is mostly low, with small segments having moderate and high probabilities. The probability for wind erosion is mostly low and moderate. Reclamation potential is mostly poor with some areas of good potential, indicating significant revegetation problems.

4.8.4 Surface Water

Comments made in Section 4.2.4 regarding impacts that occur to the surface water environment due to pipeline construction and operation as well as criteria used to determine the significance of impacts apply to this proposal.

No significant impacts to surface water are considered likely to result from construction, operation, and abandonment activities since streams crossed are all intermittent and would probably be crossed during periods of low flow.

4.8.5 Groundwater

Comments made in Section 4.2.5 regarding impacts that could occur to groundwater due to pipeline construction and operation ~~as-well as-criteria-used-to-determine-the-significance-of-impacts~~ apply to this proposal.

The greatest potential for impacts to groundwater would occur along ~~that-portion~~ approximately eight miles of proposed Loop I that would traverse the Black Mountains and Mohave Valley. In this area, the depth to groundwater is shallow to moderate and the degree of groundwater development is moderate. During excavation and installation of the pipeline, shallow aquifers could be disrupted temporarily due to dewatering. Effects from these operations would be short-term and would go unnoticed except in wells completed in the same aquifers in the immediate vicinity of the pipeline. An additional 88 miles of low impact could also occur. (See Table 4.8-3).

Table 4.8-3

POTENTIAL GROUNDWATER IMPACTS,
TRANSWESTERN EXPANSION PROPOSAL

Loop	Miles of Potential Impact High	Medium	Low	Comments
1	-	-	4.1	Moderate to great depth to water, moderate use
B	-	-	2.0	Shallow to moderate depth to water, low use
C	-	-	27.2	Moderate to great depth to water, low use
D	-	-	47.3	Moderate to great depth to water, low use
I	-	8.0	8.0	In Black Mtns and Mojave Valley. Shallow to moderate depth to water, moderate use

4.8.6 Freshwater Biology

~~Due to the scarcity of perennial aquatic habitats, general impacts to aquatic environments resulting from construction of the proposed Transwestern Expansion would not be significant. Some increased sediment loading in intermittent or ephemeral habitats would occur, but would not be significant. Potential impacts from water withdrawals and discharges due to hydrostatic testing of the pipeline may occur, but test sites have not been identified.~~ Although the Transwestern Expansion does not cross any streams with significant sport fisheries, it does cross streams possessing aquatic resources that provide a potential downstream food source for fish and a local food source for terrestrial vertebrates. These aquatic resources are relatively scarce within the project area and can be locally important. However, no significant impacts on freshwater resources would occur as a result of construction, operation, and abandonment of the loops or facilities assuming standard operating and mitigative measures were applied.

Refer to Section 4.2.6 for criteria used to delineate significance of impacts to aquatic environments.

4.8.7 Terrestrial Biology

4.8.7.1 Vegetation

Criteria used to determine the significance of impacts associated with construction of the Transwestern Expansion Proposal are the same as those discussed in Section 4.2.7.1 of the Mojave Mainline.

Denudation of vegetation would be the major impact associated with construction of the proposed loop expansions. Construction of the project would result in clearing a construction ROW approximately 100 feet wide. The clearing would take place in both existing ROW vegetation (approximately 40 feet) and native vegetation (approximately 60 feet) adjacent to the existing ROW. After construction, a 50-foot wide operational ROW would be maintained by not allowing large woody shrubs and trees to re-establish within the operational ROW. Consequently, large shrubs and trees would not revegetate a 10-foot wide zone adjacent to the existing ROW for the duration of the project, and thus would be a long-term loss. Table 4.8-4 lists the acreage of each vegetation type that would be denuded due to the construction of the Transwestern Expansion Proposal. Refer to Sections 4.7.1.7.1 and 4.7.2.7.1 of the El Paso proposal for a discussion on the significance of denudation within these types. Refer to Section 4.2.7.1 of the Mojave Proposal which discusses the potential for noxious and undesirable weed invasion within the ROW. Refer to Appendix C for a list of plant species of special concern which could be impacted (Class II) by the proposed project.

Loop 1. Approximately 50 acres of vegetation would be denuded along this loop including 30 acres of Chihuahuan creosote bush scrub (Class I impact). Two federal candidate species occur within the general area of this proposed loop. Habitat required by these species would likely be traversed by the route. Consequently, the potential that these species would be significantly impacted would be high (Class II impact).

Loop 2. Approximately 127 acres of vegetation including 76 acres of native vegetation would be denuded along this loop. Approximately 0.1 acre of wetland/riparian vegetation would be denuded (Class II impact) where the loop would cross intermittent streams. One federally listed threatened species, gypsum wild buckwheat, and two federal candidate species, one of which is also listed as endangered by the State of New Mexico, dune unicorn plant, occur within the general area of the pipeline along the proposed loop. ~~Habitat required by these species would likely be traversed (Class II impact) by the route.~~ Field surveys conducted along this loop did not encounter any habitat or individuals of gypsum wild buckwheat. Therefore, no significant impact to this species would occur. Habitat required for the remaining species would likely be traversed (Class II impact) by the route.

Table 4.8-4

VEGETATION TYPES AND DENUDED ACREAGES, TRANSWESTERN EXPANSION PROPOSAL

Loop/ Geographic Region	Vegetation Type	Impact Class 2/	Denudation 1/ (acres)				
				Native Vegetation 4/			
			ROW 3/	Short Term	Long Term	Permanent	Total
Great Plains West Texas Lateral							
1	Chihuahuan creosote bush scrub	I	19.9	0	0	29.8	49.7
2	Semidesert grassland	III	50.9	76.3	0	0	127.2
	Wetland/riparian	II	0	0.1	0	0	0.1
		Subtotal	50.9	76.4	0	0	127.3
Transwestern Mainline							
A	Plains grassland	III	126.0	189.0	0	0	315.0
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	126.1	189.1	0	0	315.2
Basin and Range							
B	Pinyon-juniper woodland	III	35.8	44.9	9.0	0	89.7
	Plains grassland	III	171.0	256.7	0	0	427.7
	Agricultural land	II	24.2	0	0	0	24.2
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	231.1	301.7	9.0	0	541.8
Colorado Plateau							
C	Semidesert grassland	III	32.5	48.7	0	0	81.2
	Plains grassland	III	99.3	149.0	0	0	248.3
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	131.9	197.8	0	0	329.7
Colorado Plateau							
D	Plains grassland	III	72.7	109.1	0	0	181.8
	Pinyon-juniper woodland	III	111.5	139.4	27.9	0	278.8
	Malpais	III	14.5	21.9	0	0	36.4
	Sagebrush scrub	III	30.4	45.7	0	0	76.1
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	229.2	316.2	27.9	0	573.3
E	Pinyon-juniper woodland	III	118.7	148.4	29.6	0	296.7
	Plains grassland	III	19.4	29.1	0	0	48.5
	Ponderosa pine woodland	II	43.6	54.6	10.9	0	109.1
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	181.8	232.2	40.5	0	454.5

Table 4.8-4 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, TRANSWESTERN EXPANSION PROPOSAL

			Denudation 1/ (acres)				
				Native Vegetation 4/			
Loop/ Geographic Region	Vegetation Type	Impact 2/ Class	ROW 3/	Short Term	Long Term	Per-manent	Total
F	Pinyon-juniper woodland	III	3.4	4.3	0.8	0	8.5
	Plains grassland	III	87.3	130.9	0	0	218.2
	Sagebrush scrub	III	110.4	165.7	0	0	276.1
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	201.2	301.0	0.8	0	503.0
G	Pinyon-juniper woodland	III	4.8	6.1	1.2	0	12.1
	Ponderosa pine woodland	II	152.6	190.8	38.2	0	381.6
	Plains grassland	III	14.6	21.8	0	0	36.4
	Agricultural land	II	12.1	0	0	0	12.1
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	184.2	218.8	39.4	0	442.4
H	Pinyon-juniper woodland	III	123.5	154.5	30.9	0	308.9
	Plains grassland	III	106.6	160.0	0	0	266.6
	Agricultural land	II	24.2	0	0	0	24.2
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	254.4	314.6	30.9	0	599.9
Basin and Range							
I	Mojavean creosote bush scrub	I	133.2	0	0	199.9	333.1
	Agricultural land	II	48.5	0	0	0	48.5
	Wetland/riparian	II	0.1	0.1	0	0	0.2
		Subtotal	181.8	0.1	0	199.9	381.8
		TOTAL	1792.5	2147.9	148.5	229.7	4318.6
Summary by Vegetation Type							
	Chihauhuan Creosote bush scrub	I	19.9	0	0	29.8	49.7
	Semidesert grassland	III	83.4	125.0	0	0	208.4
	Plains grassland	III	696.9	1045.6	0	0	1742.5
	Pinyon - juniper woodland	III	397.7	497.6	99.4	0	994.7
	Malpais	III	14.5	21.9	0	0	36.4
	Sagebrush scrub	III	140.8	211.4	0	0	352.2
	Ponderosa pine woodland	II	196.2	245.4	49.1	0	490.7
	Mojavean creosote brush scrub	I	133.2	0	0	199.9	333.1
	Agricultural land	II	109.0	0	0	0	109.0
	Wetland/riparian	II	0.9	0	0	0	1.9
		TOTAL	1792.5	2147.9	148.5	229.7	4318.6

Table 4.8-4 (continued)

VEGETATION TYPES AND DENUDED ACREAGES, TRANSWESTERN EXPANSION PROPOSAL

	Impact 2/ Class	Denudation 1/ (acres)				
			Native Vegetation 4/			
		ROW 3/	Short Term	Long Term	Per-manent	Total
Summary by Impact Class						
Class	I	153.1	0	0	229.7	382.8
Class	II	306.1	246.4	0	0	552.5
Class	III	1333.3	1901.5	148.5	0	3383.3
Class	IV	0	0	0	0	0
TOTAL		1792.5	2147.9	148.5	229.7	4318.6

1/ vegetation loss assuming a 100-foot wide construction ROW, 60 feet within native vegetation and 40 feet within existing ROW vegetation.

2/ see Section 4.2.7.1 for definitions of impact classes.

3/ denudation of existing ROW vegetation assuming a 40-foot wide zone of clearing within the ROW; does not include native vegetation.

4/ native vegetation adjacent to existing ROW, denudation/disturbance 60 feet wide:

short-term loss = vegetation loss within community types with fair or better revegetation potential; vegetation loss within total 100-foot wide construction ROW if large woody shrubs or trees not present; vegetation loss short-term within the 60-foot wide portion of the construction ROW not used for operation with large woody shrubs and trees present; vegetation loss would not be significant.

long-term loss = loss of vegetation within community types with fair or better revegetation potential containing large woody shrubs or trees present in operational ROW (50-foot wide) which would hamper operations and, therefore, would not be allowed to re-establish in the operational ROW during the life of the project; vegetation loss would not be significant. This loss would occur only within a 10-foot wide zone adjacent to the existing ROW as part of the 50-foot operational ROW.

permanent loss = loss of vegetation within community types with poor or worse revegetation potential or loss of individual plants that could not be replaced in the long term with fair or better revegetation potential; vegetation loss would be significant. This loss would occur only within the 60-foot wide portion of the 100-foot wide construction ROW within native vegetation.

Loop A. Approximately 315 acres of vegetation including 190 acres of native vegetation would be denuded along this loop. Approximately 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). ~~One federally listed endangered species, Kuenzler's hedgehog cactus,~~ Two federal candidate species and one State of New Mexico sensitive species occur within the general area of the proposed loop. Habitat required by these species would likely be traversed by the route. Consequently, the potential for significantly impacting these species is high (Class II impact). Field surveys conducted for Kuenzler's hedgehog cactus along this loop did not encounter any individuals. Some areas of potentially suitable habitat were identified. Since this habitat is important to the existence of the species, construction across this habitat could impact the species indirectly (Class II impact).

Loop B. Approximately 542 acres of vegetation including 310 acres of native vegetation would be denuded along this loop. Approximately 24 acres of agricultural land and 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). One State of New Mexico endangered species, Wright's fishhook cactus, and five federal candidate species, which are also considered sensitive by the State of New Mexico, occur within the general vicinity of this proposed loop. Habitat required by these species would likely be traversed by the route. Consequently, the potential for significantly impacting these species is high.

Loop C. Approximately 330 acres of vegetation including 130 acres of native vegetation would denuded along this loop. Approximately 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). Five New Mexico state sensitive species, of which four are federal candidate species, ~~including four species considered sensitive by the State of New Mexico,~~ and ~~two~~ one additional State of New Mexico ~~sensitive~~ endangered species occur within the general vicinity of the proposed loop. Habitat required by these species would likely be traversed by the route. Consequently, the potential for significantly impacting these species is high (Class II).

Loop D. Approximately 573 acres of vegetation including 340 acres of native vegetation would be denuded along this loop. Approximately 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). ~~One federally listed threatened species, Zuni fleabane (also considered endangered by the State of New Mexico),~~ One federal candidate species, one ~~additional~~ State of New Mexico endangered species, Wright's fishhook cactus, and ~~six~~ five species considered sensitive by the State of New Mexico occur within the general vicinity of the proposed loop. Habitat required by these species would likely be traversed by the route. Consequently, the potential for significantly impacting these species is high (Class II impact). Field surveys conducted for Zuni fleabane along the loop encountered ~~a population of the species within the proposed pipeline ROW.~~

~~Additional~~ potential habitat. ~~was identified along the loop.~~ Since this habitat is important to the existence of the species and considered endangered by the State of New Mexico, construction across this habitat could potentially impact the species indirectly (Class II impact). ~~The loss of Zuni fleabane individuals would be a significant impact (Class II).~~

Loop E. Approximately 455 acres of vegetation including 270 acres of native vegetation would be denuded. Approximately 65 acres of ponderosa pine woodland and 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). Field surveys were conducted for Peebles Navajo cactus along the proposed ROW. No individuals were found and no suitable habitat was identified. Therefore, no significant impacts would occur to the species.

Loop F. Approximately 500 acres of vegetation including 300 acres of native vegetation would be denuded. Approximately 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). Field surveys were conducted for Peebles Navajo cactus along the proposed ROW. No individuals or suitable habitat were found. ~~; however, areas of suitable habitat were encountered. The denudation of the suitable habitat could significantly impact the species (Class II impact).~~ In addition, one federal candidate species occurs within the vicinity of the pipeline along the proposed loop. Habitat required by this species would likely be traversed by the route. Consequently, the potential for significantly impacting the species is high (Class II).

Loop G. Approximately 442 acres of vegetation including 260 acres of native vegetation would be denuded along this loop. Approximately 230 acres of ponderosa pine woodland, 12.1 acres of agricultural land, and 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). Ten federal candidate species occur within the vicinity of the proposed loop, five of which are considered sensitive by the U. S. Forest Service. Habitat required by these species would likely be traversed by the route. Consequently, the potential for significantly impacting these species is high (Class II).

Loop H. Approximately 600 acres of vegetation including 345 acres of native vegetation would be denuded along this loop. Approximately 24 acres of agricultural land and 0.2 acres of wetland/riparian vegetation would be denuded (Class II impact). One federal candidate species occurs within the vicinity of the proposed loop. Habitat required by this species would likely be traversed by the route. Consequently, the potential for significantly impacting the species is high (Class II). Close examination of the geologic substrate, soils, topography, and vegetation type along the loop revealed that there is a low potential that Arizona cliffrose, a federally listed endangered species, occurs along the loop, and therefore, would probably not be impacted.

Loop I. Approximately 382 acres of vegetation would be denuded along this loop including 200 acres of native Mojavean creosote bush scrub (Class I impact). Approximately 49 acres of agricultural land and 0.2 acre of wetland/riparian vegetation would be denuded (Class II impact). One federal candidate species occurs within the vicinity of the proposed loop. Habitat required by this species would likely be traversed by the route. Consequently, the potential for significantly impacting the species is high (Class II).

4.8.7.2 Wildlife

General impacts to wildlife associated with the construction of the Transwestern Expansion Proposal and criteria used to assess significant impacts are the same as described for the proposed Mojave pipeline (Section 4.2.7.2). Table 3.7-7 lists important wildlife features along the proposed loops. Table 3.7-8 lists potential occurrence of species of special concern along the proposed loops.

Numerous riparian areas, generally associated with stream crossings, can be found along the project route. These areas are not quantified separately but are very important to general wildlife and some species of special concern. Disturbance or destruction of riparian areas would be a Class II impact.

Loop 1. No significant impacts to general wildlife would occur along the proposed loop. Disturbance and loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Swainson's hawks potentially nest along the proposed loop. Disturbance within one half mile of an active nest would be a Class II impact.

Loop 2. One water tank exists within the area of concern. If construction activities destroyed this important water source, it would be a Class II impact. Disturbance and loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Interior least terns may periodically pass through the area foraging for food, but are generally found to the north of the proposed loop in the Bitter Lake NWR. Pipeline construction would not affect this species.

The dune sagebrush lizard has never been sighted in the area of the proposed loop, but does potentially occur in the area [Juen, 1986]. This loop crosses approximately seven miles of potential habitat of this lizard. If the proposed loop crosses any viable populations, construction activities would result in the loss of individuals due to crushing by heavy equipment or entrapment in the open pipeline trench. Loss of individuals would be a Class I impact.

Bell's vireo and ferruginous hawk may also utilize the area for nesting or foraging, but specific data on occurrence are lacking [Juen, 1986]. Lack of trees in the area minimizes the possible impacts to nesting pairs. Disturbance of active nests would be a Class II impact.

Three species listed as Group 2 Endangered by the State of New Mexico also potentially occur along the proposed loop and include Baird's sparrow, McCown's longspur and Trans-Pecos rat snake. The Trans-Pecos rat snake has been sighted in the area near draws, but specific habitat has not been identified [Juen, 1986]. Loss of individuals through crushing by heavy equipment, entrapment in the open pipeline trench and other project-associated mortality would be a significant impact. Mitigation measures would minimize losses, but not negate them. Consequently loss of individuals would be a Class I impact. Baird's sparrow and McCown's longspur potentially nest along this loop. Disturbance of active nests would be a Class II impact.

Loop A. Three wildlife concentration areas occur along the proposed loop in major drainages. Species potentially concentrated within these drainages include the mule deer and pronghorn antelope. In addition, the Macho Wildlife Habitat Area is crossed by approximately 26 miles of the proposed loop. This area provides habitat for pronghorn, mourning doves and scaled quail. Disturbance of wildlife within the concentration areas and the Macho Wildlife Habitat Area would be short term effects and a Class III impact. Disturbance and loss of approximately 160 acres of habitat within the designated Habitat Area would be a Class II impact.

Species of Special Concern. Ferruginous and Swainson's hawks, Baird's sparrow and McCown's longspur potentially nest along the proposed loop expansion. Disturbance of any of the species during nesting would be a Class II impact. The Trans-Pecos rat snake potentially occurs along this loop. Loss of individuals, as described under Loop 2, would be a Class I impact.

Loop B. The proposed loop crosses approximately three miles of critical mule deer winter range. Construction activities during the winter stress period would be a Class II impact. Loss of approximately 18 acres of this habitat would be a Class III impact. Three water tanks and one natural spring along the proposed loop represent concentration areas for wildlife. The destruction or degradation of these important water sources would be a Class II impact. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. Although approximately 39 miles of the proposed loop lies within potential habitat for prairie dogs, no viable towns are known to occur within one half mile of the alignment. If ferrets are present, any construction or operational activities that result in disturbance or loss of individuals would be a Class II impact. Prairie dogs could benefit from the soil disturbance and removal of vegetation, and may occur in higher densities along the ROW after construction. This would be an increase in potential ferret habitat and a Class IV impact.

Ferruginous and Swainson's hawks potentially nest along the length of this loop. Disturbance within one half mile of active nests would be a Class II impact.

Loop C. No significant impacts to general wildlife would occur along this proposed loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. Densities of prairie dogs in Valencia County, New Mexico, which is traversed by the proposed loop, are among the highest in New Mexico [NMGF, 1984]. Approximately 20 miles of potential prairie dog habitat is crossed by this loop; however, an aerial survey in March 1986 did not locate any prairie dog colonies along the proposed loop. If ferrets are present within one half mile of the ROW, impacts would be the same as discussed previously under Loop B.

The proposed loop is proximate to potential peregrine falcon nesting habitat along the latter five miles of the route. No aeyries are known to occur within this area. Ferruginous and Swainson's hawks, and mountain plovers potentially nest along the proposed loop expansion. Disturbance of an active nest of these species would be a Class II impact.

Loop D. No significant impacts to general wildlife would occur along this proposed loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Species and impacts are similar to those discussed under Loop C. Peregrine falcon habitat is present for approximately 6.5 miles of this loop. About 15 miles of potential prairie dog (ferret) habitat is crossed by this loop. In addition, the gray vireo potentially nests within pinyon-juniper and desert scrub habitat along this loop. No nests have currently been identified. Disturbance of active nests would be a Class II impact.

Loop E. No significant impacts to general wildlife would occur along this proposed loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Species and impacts are similar to those discussed under Loop C. Potential peregrine habitat along this loop is restricted to approximately four miles, and potential prairie dog (ferret) habitat is limited to approximately four miles.

Loop F. No significant impacts to general wildlife would occur along this proposed loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. Swainson's and ferruginous hawks, and mountain plovers potentially nest along this proposed loop. At present, no active nests have been delineated within the area of concern. Disturbance of an active nest of these species would be a Class II impact.

This loop crosses approximately 18 miles of potential prairie dog habitat. Viable colonies provide habitat for the black-footed ferret. At present, no active colonies are known to occur within one half mile of the loop. If ferrets are present, impacts would be the same as discussed for Loop B.

Loop G. ~~Three~~ Twelve water tanks and ~~three~~ four natural springs occur ~~along~~ within one-half mile of this proposed loop. Destruction or degradation of these important water sources would be a Class II impact. This loop would traverse a meadow commonly used by elk at MP 447.0-477.8. The proposed loop crosses approximately two miles of a mule deer fawning area. Construction activities that disturb does during this critical period of their life cycle would be a Class II impact. Loss of approximately 12 acres of this limited mule deer fawning habitat would be a Class II impact. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The proposed loop runs adjacent to approximately four miles of southern spotted owl habitat. No active nests have been identified within the area of concern. Construction activities that disturb active spotted owl nests would be a Class II impact. The loop will bisect, in one case, and run tangent to, in another case, the known range of two pairs of radio-tagged Southern spotted owls.

The potential exists for black-footed ferrets within viable prairie dog colonies. This loop crosses approximately four miles of potential prairie dog habitat; however, no active colonies have been identified along the proposed loop. If ferrets are present within one half mile of the alignment, impacts would be the same as discussed under Loop B.

Ferruginous and Swainson's hawks, and mountain plovers potentially nest along the proposed loop expansion. Disturbance of active nests of these species would be a Class II impact.

Loop H. The proposed loop crosses approximately 18 miles of high value pronghorn antelope habitat. Disturbance of pronghorn would be a Class III impact; disturbance of this habitat would be a Class III impact. Thirty-one miles of high value javelina and mule deer habitat is crossed by this proposed loop. Disturbance of javelina and mule deer would be a Class III impact; disturbance of this habitat would be a Class III impact. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. The potential exists for black-footed ferrets within viable prairie dog colonies. This loop crosses approximately 11 miles of prairie dog habitat where significant viable colonies have been identified. If ferrets are present, impacts would be the same as discussed for Loop B.

The proposed loop crosses approximately nine miles of potential peregrine nesting habitat. No nests are known for the area of concern. Disturbance of an active aeyrie would be a Class II impact.

Ferruginous and Swainson's hawks, and mountain plovers potentially nest along the proposed loop. Disturbance of active nests of these species would be a Class II impact.

Loop I. No significant impacts to general wildlife would occur along this proposed loop. Loss of general wildlife habitat along the extent of this loop would be a Class III impact.

Species of Special Concern. High and medium value desert bighorn sheep habitat occurs along approximately seven miles of the proposed loop in the Black Mountains. Desert bighorn habitat in this area has been classified as endangered by the State of Arizona due to the high degree of human disturbance in the area. Loss of habitat would be a Class II impact. Disturbance of individuals would be a Class III impact.

The Black Mountains have also been identified as potential nesting habitat for the peregrine falcon. The proposed loop crosses approximately three miles of this terrain. Disturbance of an active aeyrie would be a Class II impact.

The Gila monster is a rare species throughout its range, and loss of individuals through crushing by heavy equipment and vehicles, or entrapment in the open pipeline trench would be a Class I impact.

Approximately 15 miles of the proposed loop crosses potential desert tortoise habitat. At present, no specific populations or tortoise densities are known for the area of concern. Because the majority of populations identified within Arizona have densities between 25-50 tortoise per square mile [Schwable, 1986], it is assumed that the potential densities within the affected area fall within this range. Construction and revegetation activities at any time of year would result in ~~loss of~~ death or injury to individuals due to crushing on the surface or inside burrows; loss of cover and increased human activity would increase tortoise susceptibility to predators. Tortoises could also be lost or injured by falling into the open trench. Utilizing the midpoint figure (37.5 tortoise/mi^2) for the assumed density range discussed above and a 100-foot ROW, approximately 11 tortoises would potentially be lost through construction activities. Although detailed ~~mitigation~~ conservation measures are available to minimize loss of individuals, it is assumed that they would not completely negate all losses. Therefore, loss of individuals would be a Class I impact. Because of the poor revegetation potential of the creosote bush scrub community, loss of approximately 73 acres of suitable habitat would be a Class I impact.

Summary of Significant Impacts. Table 4.8-5 presents an abbreviated form of the significant impacts for this proposal.

Construction of the Transwestern Expansion Proposal would potentially disturb six water tanks and four natural springs. This would be a Class II impact. The proposed project crosses three miles of critical mule deer winter range. Disturbance during winter would be a Class II impact. Approximately two miles of mule deer fawning range are crossed by the proposed route. Disturbance during fawning would be a Class II impact. Loss of approximately 12 acres of this fawning habitat would be a Class II impact. Loss of approximately 160 acres within the Macho Wildlife Habitat Area would be a Class II impact. A total of approximately 172 acres of habitat would be affected as a Class II impact.

Table 4.8-5

SIGNIFICANT WILDLIFE IMPACTS,
TRANSWESTERN EXPANSION PROPOSAL

Wildlife Class	Impact to [1] Individuals	Impact to Habitat
Big game	5 miles (II) [2]	172 acres (II)
Water Sources		6 tanks; 4 springs (II)
Species of Special Concern [3]	59 miles (I) 260 miles (II)	73 acres (I) 42 acres (II)

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[1] Impacts to individuals are quantified by cumulative miles of proposed pipeline where impacts would occur.

[2] Indicates impact class: I= Significant adverse impact that could not be mitigated or avoided; II= Significant adverse impact that could be feasibly mitigated or avoided.

[3] Species of Special Concern include all federally listed species, candidates for listing and state listed species.

Two of the most significant long-term impacts that a developed pipeline ROW has on wildlife populations are 1) increased forage/edge in forest and woodland habitats (a Class IV impact), and 2) increased human access (a Class II or III impact). Increased forage/edge is a favorable impact, but increasing public access reduces habitat use by wildlife. If roads are improved along the proposed loop as a result of construction, the impact on wildlife will be negative. However, it is unlikely that a new access or significant improvement of existing access would occur.

Species of Special Concern. Approximately 111 miles of potential prairie dog habitat are crossed by the proposed loops. Viable prairie dog colonies provide suitable habitat for black-footed ferrets. If ferrets are present, construction activities would be a Class II impact. The proposed route is proximate to about 27 miles of potential peregrine nesting habitat. Disturbance of active aeyries would be a Class II impact. Ferruginous and Swainson's hawks potentially nest along approximately 229 miles of this loop expansion project.

The proposed loops cross approximately 37 miles of potential nesting habitat for Baird's sparrow, McCown's longspur and Bell's vireo. Another 29 miles of gray vireo potential nesting habitat is crossed by the proposed route. Approximately four miles of southern spotted owl habitat is traversed. Disturbance of active nests of any of these species would be a Class II impact. Much of the above linear distance of Class II impacts overlap between species. The proposed Transwestern Expansion Proposal crosses an approximate total of 260 miles of potential Class II impact to species of special concern. Approximately seven miles of ~~endangered~~ crucial bighorn sheep habitat are crossed by the proposed loops. Disturbance of approximately 42 acres of this habitat is a Class II impact. A total of approximately 59 miles of the proposed loops cross potential Class I impacts to species of special concern. This includes the dune sagebrush lizard (7 mi), Trans-Pecos rat snake (37 mi), and the Gila monster and desert tortoise (15 mi). Approximately 73 acres of desert tortoise habitat would be lost. This is a Class I impact.

4.8.7.3 Grazing

The criteria for evaluating significant and general impacts to grazing are the same as those discussed in Section 4.2.7.3. Given the above referenced criteria for significant impacts and scenario for the proposed action, no significant impacts were determined with the exception of the San Mateo Allotment. The project would affect less than one percent of all other allotments traversed as noted in Appendix D. Fencing and livestock guards are very important in maintaining livestock control and separation for the affected allotments. Maintaining that separation and control is of paramount importance to the permittees and private landowners grazing enterprises.

The San Mateo Allotment (BLM No. 432) would have 6.6 percent of its acreage affected by the proposed Loop D (Appendix C-4). About 22 animal unit months would be affected if the BLM elected to reduce the stocking rate by 6.6 percent. This allotment is 1,782 acres and would be traversed by 9.8 miles of Loop D. The poor revegetation potential of the land would result in a reduction of 117.6 acres of forage.

4.8.8 Socioeconomics

4.8.8.1 Population, Housing, and Economic Impacts

Transwestern Pipeline Company proposes to expand its existing pipeline system between Pyote in Ward County, Texas, and its Needles metering station by looping 356.4 miles of pipeline in 11 loop segments. The expansion will directly affect 4,315 acres of land during construction and 2,160 acres during operation. No facilities are to be affected by the proposed expansion.

Four spreads will be used to construct the 11 loops:

1) Texas/New Mexico Spread, Ward County, TX - 4.05 miles and Eddy County, NM - 10.44 miles
2) New Mexico Spread, Lincoln, Socorro, Torrance and Valencia Counties, NM - 97.35 miles
3) New Mexico/Arizona Spread, McKinley County, NM - 41 miles and Apache County, AZ - 86.19 miles
4) Arizona Spread, Coconino, Yavapai and Mohave Counties, AZ-118.88 miles

Transwestern Pipeline Expansion will occur in five counties in Arizona, one in Texas, and six in New Mexico. These counties will experience an influx of local population increase for a period of up to 7.5 months or 225 days based on information provided by the pipeline company [Transwestern, March 1986]. As presented in Table 4.8-6, construction crews required for the expansion project will total 1,317 workers of which 65 percent or 856 will move into the local area to work. In addition, 102 non-local miscellaneous personnel such as company representatives, inspectors, and engineers will be required. An estimated .3 dependents per worker per spread are expected to accompany the inmigrant workers based on a 1979 survey of pipeline construction workers. Therefore, the total inmigrant population will be 1,247 persons distributed among 12 counties for a period of up to 7.5 months. Population changes by county are not projected to exceed the significance criteria and will not exceed 1 percent of the existing population in any of the affected counties.

In addition to the inmigrant labor, 460 local residents are expected to be hired for the project. These individuals will most likely be lesser skill types such as truck drivers and common laborers.

Table 4.8-6

AGGREGATE SOCIOECONOMIC IMPACT INFORMATION, TRANSWESTERN EXPANSION PROPOSAL

Characteristics	Project Component Spread No. 1	Spread No. 2	Spread No. 3	Spread No. 4
Location	Ward, TX/ Eddy, NM	Linc./Torr./ Soco./ Vale., NM	Vale./McKin.,NM Apac./Nava./ Coco., AZ	Coco./Yava./ Mohave,AZ
Length (miles)	14.49	97 .35	127.19	118.88
Construction duration (days)	60	210	225	218
Construction crew	230	350	375	362
Other personnel required for construction	21	27	27	27
Local construction personnel	80	122	131	127
Nonlocal construction personnel	171	255	271	262
Dependents of nonlocal personnel	51	77	81	79
Total immigrant population	222	332	352	341
Housing demand by inmigrants (units):				
Hotels/Motels	74	110	117	113
Rental Units	48	71	76	73
R/V Campsites	46	69	73	71
Other	3	5	5	5
Local expenditures by nonlocal construction personnel	$702,810	$3,668,175	$4,176,788	$3,912,446
Local expenditures by local construction personnel	698,880	3,730,272	4,299,750	4,021,559
Local expenditures by contractors	142,892	960,008	1,254,272	1,172,324

Operation Personnel Total = 0

SOURCES:

All data with the exception of dependents, local expenditures by contractors, and operation personnel were derived from a response to questions on equipment use, construction methods, and employment data dated March 1986 and provided by the Transwestern Pipeline Company. The number of dependents was estimated based on .3 dependents per inmigrant worker [BLM, 1979]. Operation personnel were assumed from the El Paso Project where no operation personnel are anticipated based on preliminary operating budgets [El Paso Natural Gas Company, 1985, Exhibit N]. The local expenditures by contractors were also derived from the El Paso data and reflect miscellaneous materials purchases for lack of better information.

Transwestern reports that each nonlocal worker will spend an average of $68.50 per day. Expenditures per day per local worker will equal $145.60 of wages earned on the project [Transwestern, March 1986]. Total expenditures by nonlocal construction personnel will equal $12.4 million. Expenditures by local construction personnel will total $12.7 million (Table 4.8-6). Expenditures by the contractors on miscellaneous local goods and services are expected to total $3,529,496. This estimate was derived using a per mile miscellaneous purchase amount from the El Paso Expansion Proposal [El Paso Natural Gas Company, 1985] and will include parts, repairs, fuel, and miscellaneous tools and equipment.

Increased income to local persons, the influx of a population which spends money into the local area, and the local purchases by contractors will result in increased sales to area merchants, as well as additional tax revenues to local jurisdictions. In addition to the tax revenues created by local spending, the pipeline loops will contribute to the local tax base on which property taxes are assessed. Table 4.8-7 presents the total assessed value in each county and the incremental percentage the pipeline expansion will comprise of the current total. Of the counties in the study region, Torrance and Valencia will experience the most significant increases in tax base in New Mexico, while Navajo and Yavapai will experience the most significant increases in total county assessed value in Arizona.

Since the total inmigrant population will exceed 1,200 persons in the 12 affected counties, the availability of temporary housing is an issue. Estimates of housing requirements for inmigrant workers by housing unit type (Table 4.8-8) are Hotels/Motels-14, Rental Units - 268, R/V Campers - 259, and Other - 18 and are based on the distribution of demand for temporary housing reported by Transwestern which is very similar to other relevant projects.

In Arizona, demand for motels is not met by available supply in Apache County. In addition, there is no supply of RV spaces in Apache County to meet the demand for 73 spaces. The need will exist to provide work camps or, more logically, commute longer distances to either Gallup in New Mexico or Holbrook and Winslow in Navajo County. The demand for rental spaces in Holbrook and Winslow, however, will not be met by available supply resulting in a shift of demand there to motel accommodations.

In New Mexico, shortfalls will exist for the demand for motels in Torrance and Lincoln Counties. This will require longer commutes from either Albuquerque in Bernalillo County or Roswell in Chaves County. The shortfall in the demand for rental units in Socorro will require similar commuting patterns or a shift in demand to motel accommodations. The low supply of RV spaces in Grants will necessitate a shift to other types of supply or commuting from RV parks in the Albuquerque or Gallup areas.

Table 4.8-7

CONTRIBUTION TO COUNTY TAX BASE, TRANSWESTERN EXPANSION PROPOSAL

State/County	Length of Line (miles)	Estimated Taxable Value of Pipeline and Facilities (Millions)	Total 1984/1985 County Assessed Value (Millions)	Pipeline Percentage of Total Value	1984/1985 County Tax Revenues (Millions)
ARIZONA					
Apache	30.50	$15.6	$ 343.0	4.55%	$18.7
Coconino	41.00	21.0	488.4	4.30	28.1
Mohave	42.75	21.9	377.7	5.79	36.2
Navajo	37.00	18.9	497.2	3.81	30.8
Yavapai	38.25	19.6	448.0	4.37	39.0
NEW MEXICO					
Eddy	10.00	5.1	752.6	0.68	10.9
Lea	0.50	0.3	1,481.1	0.02	23.1
Lincoln	35.25	18.0	140.5	12.84	6.0
Socorro	12.00	6.1	48.6	12.64	1.4
Torrance	23.50	12.0	55.7	21.60	1.1
Valencia	45.00	23.0	144.7	15.92	4.1
TEXAS					
Ward	4.10	2.1	1,449.1	0.14	5.3

SOURCES:

Values of all pipeline loops were derived using a weighted average pipeline cost from the El Paso Pipeline Project [El Paso Natural Gas Company, 1985]. Local tax data were obtained from Arizona State Dept. of Revenue, State of New Mexico Department of Finance and Administration, and Texas State Property Tax Board.

Table 4.8-8

HOUSING DEMAND DISTRIBUTION BY AFFECTED AREA, TRANSWESTERN EXPANSION PROPOSAL

	Temporary Housing									
	Hotel/Motel Rooms			Rental Units			RV Spaces			
State/County/City	Supply	Demand	%	Supply	Demand	%	Supply	Demand	%	Permanent Housing
ARIZONA										
Apache	56	117	209	492	76	15	0	73	2/	782
Coconino	1,450 1/	81	6	931			490	43	9	1,310
Flagstaff	2,655	149	6	234	149	64	1,169	101	9	330
Mohave	20 1/	1	5	811						1,459
Kingman	1,480	65	4	64	29	45	328	22	7	116
Lake Havasu City	1,650	47	3	153	44	29	1,114	49	4	275
Navajo				646			100	27	27	1,038
Holbrook	748	63	8	23	26	115	152	37	24	36
Winslow	547	54	10	38	50	133	23	7	30	60
Yavapai	186	113	61	838			232	71	31	1,670
NEW MEXICO										
Eddy				451						620
Artesia	221	13	6	90	16	18	11	2	18	124
Carlsbad	1,190	61	5	206	32	16	282	44	16	283
Lea				761						1,056
Hobbs	635	0	0	392	0	0	48	0	0	544
Lincoln	0	110	**	326	71	22	76	69	91	469
McKinley				343			194	28	14	482
Gallup	1,600	117	7	81	76	94	311	45	14	114
Socorro				131						162
Socorro	360	110	31	60	71	118	100	69	69	74
Torrance	0	110	**	110	71	65	108	69	64	152
Valencia (Includes Cibola)				760						1,131
Belen	84	14	17	78	50	64	0	0	2/	116
Grants	1,000	213	21	117	97	83	75	142	189	174
TEXAS										
Ward				116						100
Monahans	180	12	7	58	9	16	46	18	39	90
Reeves				199						258
Pecos	511	16	12	143	39	27	40	28	70	185

1/ Additional rooms and RV spaces in the county near the ROW
2/ Infinite percentage resulting from division by zero

SOURCES:

Hotel/Motel supply derived from Affected Environment Sections. Rental Units supply is calculated as those units for rent. Year round supply is calculated as those units for rent or sale. Units listed as vacant awaiting occupancy or demolition, held for occasional use, or boarded up were not included. Due to a lack of data on rental unit or year-round unit available housing supply for individual cities, the relationship between the numbers of these types of units and total housing units in the county in which the city exists was used to adjust total vacant units in each individual city.

4.8.8.2 Traffic

No delays in traffic flow are anticipated since unpaved and local roads have a light volume of traffic, and paved roads with higher traffic volumes will be bored under.

4.8.8.3 Noise

Section 4.2.8.3 details the general construction noise levels which would occur during construction of the Transwestern Expansion Proposal. Increased noise levels would be short-term, lasting generally fewer than 10 working days at any particular point along the proposed loops. Temporary increases in noise would be of greater impact where construction occurs in or adjacent to residential areas. Since few residential areas are in the vicinity of the proposal loops and the noise impacts are considered to be short-term during daylight hours, the overall impacts would not be significant.

4.8.8.4 Recreational Resources

No impacts are expected to occur at developed recreational sites within the mile-wide corridors of any of the proposed loops. There may be competition for camping spaces within the Coconino and Kaibab National Forests and some increase in traffic congestion should the construction occur during the busy summer months. The abundance of motel rooms and RV spaces in Flagstaff, however, makes the probability of significant usage of Forest campgrounds unlikely. Since Cimarron Lake is privately owned and operated, it is probably unavailable to both construction workers and the general public.

4.8.9 Land Ownership/Use

Land use impacts will be assessed according to the degree of conflict between the proposed routing and existing land uses or policies regarding land use.

Table 4.8-9 shows the number of acres that would be disturbed for each loop by land ownership category. Table 4.8-10 shows the number of acres that would be disturbed for each loop by land use category.

Loops 1, 2, A, B, C, ~~D,~~ E, F, and H have no identified land use conflicts. Three potential conflicts have been identified for Loop G, and one conflict exists for Loop I.

Loop D would pass through an existing sand and gravel operation owned by the Griego Trucking Company.

Table 4.8-9

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Private Acres	BLM Acres	State Acres	FS Acres	Indian Acres
West Texas Lateral Loop 1	Ward, TX	100' Construction	49.7	43.6	-	6.1	-	-
		50' Operation	24.8	21.8	-	3.0	-	-
Loop 2	Eddy, NM	100' Construction	121.2	-	109.1	12.1	-	-
		50' Operation	60.6	-	54.5	6.1	-	-
	Lea, NM	100' Construction	6.1	-	6.1	-	-	-
		50 ' Operation	3.0	-	3.0	-	-	-
Subtotal		100' Construction	127.3	-	115.2	12.1	-	-
		50' Operation	63.6	-	57.6	6.1	-	-
MAINLINE Loop A	Lincoln, NM	100' Construction	315.2	138.2	166.1	10.9	-	-
		50' Operation	157.6	69.1	83.0	5.5	-	-
Loop B	Lincoln, NM	100' Construction	111.5	83.6	-	27.9	-	-
		50' Operation	55.8	41.8	-	13.9	-	-
	Socorro, NM	100' Construction	150.3	124.8	12.1	13.3	-	-
		50' Operation	75.2	62.4	6.1	6.6	-	-
	Torrance, NM	100' Construction	280.0	126.1	-	154.0	-	-
		50' Operation	140.0	63.0	-	77.0	-	-
Subtotal		100' Construction	541.8	334.5	12.1	195.2	-	-
		50' Operation	271.0	167.3	6.1	97.6	-	-
Loop C	Valencia, NM	100' Construction	169.7	53.3	-	9.7	-	106.7
		50' Operation	84.8	26.7	-	4.8	-	53.3
	Cibola, NM	100' Construction	160.0	-	-	-	-	160.0
		50' Operation	80.0	-	-	-	-	80.0
Subtotal		100' Construction	329.7	53.3	-	9.7	-	266.7
		50' Operation	164.8	26.7	-	4.8	-	133.3
Loop D	Cibola, NM	100' Construction	218.2	189.1	12.1	17.0	-	-
		50' Operation	109.1	94.5	6.1	8.5	-	-

Table 4.8-9 (continued)

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND OWNERSHIP, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Private Acres	BLM Acres	State Acres	FS Acres	Indian Acres
Loop D (continued)	McKinley, NM	100' Construction	355.2	195.2	19.4	50.9	-	89.7
		50' Operation	177.6	97.6	9.7	25.5	-	44.8
Subtotal		100' Construction	573.3	384.2	31.5	67.9	-	89.7
		50' Operation	286.7	192.1	15.8	33.9	-	44.8
Loop E	McKinley, NM	100' Construction	90.9	43.6	-	-	-	47.3
		50' Operaton	45.5	21.8	-	-	-	23.6
	Apache, AZ	100' Construction	363.6	-	-	-	-	363.6
		50' Operation	181.8	-	-	-	-	181.8
Subtotal		100' Construction	454.5	43.6	-	-	-	410.9
		50' Operation	227.3	21.8	-	-	-	205.5
Loop F	Navajo, AZ	100' Construction	423.0	64.2	-	-	-	358.8
		50' Operation	211.5	32.1	-	-	-	179.4
	Coconino, AZ	100' Construction	78.8	12.1	-	-	-	66.6
		50' Operation	39.4	6.1	-	-	-	33.3
Subtotal		100' Construction	501.8	76.4	-	-	-	425.5
		50' Operation	250.9	38.2	-	-	-	212.7
Loop G	Coconino, AZ	100' Construction	442.4	63.0	-	-	378.2	-
		50' Operation	221.2	31.5	-	-	189.1	-
Loop H	Yavapai, AZ	100' Construction	467.9	249.7	-	218.2	-	-
		50' Operation	233.9	124.8	-	109.1	-	-
	Mohave, AZ	100' Construction	133.3	101.8	-	31.5	-	-
		50' Operation	66.7	50.9	-	15.8	-	-
Subtotal		100' Construction	601.2	351.5	-	249.7	-	-
		50' Operation	300.6	175.8	-	124.8	-	-
Loop I	Mohave, AZ	100' Construction	381.8	175.8	174.5	15.8	-	15.8
		50' Operation	190.9	87.9	87.3	7.8	-	7.8
Total		100' Construction	4318.8	1664.2	499.4	567.3	566.1	378.2
		50' Operation	2158.2	832.1	249.7	283.6	604.2	189.1

BLM = Bureau of Land Management FS = Forest Service

Table 4.8-10

CONSTRUCTION AND OPERATION DISTURBANCE BY LAND USE, TRANSWESTERN EXPANSION PROPOSAL

Pipeline Component	County, State	Disturbance Area	Total Acres	Grazing/ Rangeland Acres	Timber/ Forest Acres	Residential Acres	Other Acres
Loop 1	Ward, TX	100' Construction	49.7	49.7	-	-	-
		50' Operation	24.8	24.8	-	-	-
Loop 2	Eddy, NM	100' Construction	127.3	127.3	-	-	-
	Lea, NM	50' Operation	63.6	63.6	-	-	-
Loop A	Lincoln, NM	100' Construction	315.1	315.1	-	-	-
		50' Operation	157.6	157.6	-	-	-
Loop B	Lincoln, Torrance,	100' Construction	541.8	541.8	-	-	-
	Socorro, NM	50' Operation	270.9	270.9	-	-	-
Loop C	Valencia,	100' Construction	329.7	329.7	-	-	-
	Cibola, NM	50' Operation	164.8	164.8	-	-	-
Loop D	Cibola,	100' Construction	573.3	573.3	-	-	-
	McKinley, NM	50' Operation	286.7	286.7	-	-	-
Loop E	McKinley, NM	100' Construction	454.5	454.5	-	-	-
	Apache, AZ	50' Operation	227.3	227.3	-	-	-
Loop F	Navajo,	100' Construction	501.8	501.8	-	-	-
	Coconino, AZ	50' Operation	250.9	250.9	-	-	-
Loop G	Coconino, AZ	100' Construction	442.4	63.0	379.4	-	-
		50' Operation	221.2	31.5	189.7	-	-
Loop H	Yavapai,	100' Construction	601.2	601.2	-	-	-
	Mohave, AZ	50' Operation	300.6	300.6	-	-	-
Loop I	Mohave, AZ	100' Construction	381.8	212.1	-	116.4	53.3
		50' Operation	190.9	107.3	-	58.2	26.7
Total		100' Construction	4318.8	3769.7	379.4	116.4	53.3
		50' Operation	2158.2	1884.8	189.7	58.2	26.7

Loop G passes within 0.5 mile of three parts of the Fort Valley Experimental Forest. These areas are used for long-term research of ponderosa pine stands and have been studied for the past 62 years. The easternmost parcel is located between MP 458 and 458.5, about 500 feet south of the proposed route. Because this is outside both the construction and operation disturbance area, no impact is expected. From MP 466.5 to 469.0 the route would be located on the northern boundary of the experimental forest and would pass through one mile within the boundary. Between MP 469 to 470 it would also pass along the northern boundary of another portion of the experimental forest. Transwestern's expansion of Loop G would not be in conformance with the Coconino National Forest Plan and would therefore be a significant impact.

At MP 463 Loop G crosses Forest Road 146 and the waterline that serves the City of Flagstaff. Potential disruption of water and city personnel access to the inner basin could impact the city of Flagstaff for the short-term. Any houses within 100 feet would be impacted both on short- and long-term basis. At MP 470 to 475, Loop G crosses private subdivisions located within the boundaries of Kaibab NF.

Loop I would ~~significantly--impact~~ probably not cause a significant impact to the Fort Mojave Indian ~~Reservation-land-by conflicting-with-future-plans-for-development-by-leasing-the-land to-process-organic-mulch~~ Reservation's future development plans since there is already a pipeline in this location.

4.8.10 Cultural Resources

4.8.10.1 Archaeology

Loop 1. There are no documented sites for this loop; however, no surveys have been conducted.

Loop 2. One known site is located in the zone of direct impact. It is an Archaic/Mogollon site consisting of bedrock mortars and a lithic-ceramic-groundstone scatter. Only 9.5 percent of the direct impact zone has been surveyed. One known site, a lithic scatter, is located in the zone of indirect impact.

Loop A. There are no documented sites for this loop; however, no surveys have been conducted.

Loop B. There is one known site in the zone of direct impact. It is a lithic-ceramic scatter, possibly dating to the Archaic period. Only 3.4 percent of the direct impact zone has been surveyed.

Loop C. Two known sites are present in the zone of direct impact. One is a ceramic scatter and consists of a hearth with a lithic-ceramic scatter. The cultural affiliation of these sites is unknown. No surveys have been conducted to BLM standards.

Two known sites fall within the zone of indirect impact: a lithic-ceramic scatter of unknown cultural affiliation and an Archaic site composed of groundstone and lithics. The latter site has been determined ineligible for the National Register.

Loop D. Nine sites fall within the zone of direct impact. Seven are prehistoric (Pueblo II and III) and include three ceramic scatters, a ceramic-lithic scatter, a rock alignment and associated artifact scatter, a mound and associated midden, and a roomblock with associated artifacts. Two sites are historic: an historic Navajo structure with associated trash and a foundation with associated hearth. Only 4.2 percent of the direct impact zone has been surveyed.

A total of 21 sites are located in the zone of indirect impact. They include 15 prehistoric and six historic sites or components. The prehistoric sites consist of seven roomblocks or structures with associated artifacts and three mound sites associated with such features as a depression, a rock alignment or artifact scatter. Other sites include four hearth sites and four artifact scatters. Two sites have both prehistoric Anasazi and historic Navajo components and there are two Navajo sites with such features as hogans and/or corrals.

Loop E. There are no documented sites within the direct impact zone. Only 1.3 percent of the direct impact zone has been surveyed.

One known site is situated within the zone of indirect impact, an historic Navajo corral.

Loop F. There are 12 known sites located in the zone of direct impact. They include six prehistoric roomblocks with associated ceramics and/or lithics, four lithic-ceramic scatters, one ceramic and one lithic scatter. One of the lithic-ceramic scatters has been determined ineligible for the National Register.

There are eight known sites located in the zone of indirect impact. They include five prehistoric roomblocks with associated ceramic-lithic or ceramic scatters and two artifact scatters. Another prehistoric site is of unknown type. No surveys have been conducted within the direct impact zone.

Loop G. Eight known sites are located in the zone of direct impact. They include four pueblo structures with associated artifacts, three artifact scatters and a pithouse site. About 49.3 percent of the direct impact zone has been surveyed.

A total of 21 known sites are situated in the indirect impact zone. They include a pithouse village and two pithouse sites, an Archaic period hunting blind, seven roomblocks or structures with associated artifact scatter, and nine lithic and/or ceramic scatters. Another site is composed of a structure and a check dam.

Loop H. There are six known sites within the direct impact zone. They include a rock ring, two structures with associated lithic-ceramic scatter, a rockshelter, and two lithic scatters. No surveys have been conducted within the analysis corridor.

There are no known sites in the indirect impact zone.

Loop I. There is one site in the direct impact zones: a historic trail listed in the SHPO files of Arizona. Only 2.4 percent of the direct impact zone has been surveyed.

There is one known site in the zone of indirect impact: a historic road listed in the Arizona SHPO files.

All Loops. There are a total of 40 sites in the zone of direct impact for all expansion loops. One site has been determined ineligible for the National Register. There are 55 sites in the zone of indirect impact. One site has been determined ineligible for the register. Only 6.7 percent of the direct impact area has been surveyed to BLM standards. It should be noted, however, that parts of Loops C, D, F, and H were surveyed by Wendorf et al. [1956], but not to current BLM standards.

There are ~~four~~ five high sensitivity pipeline segments along Loops D, E, F, G, and I.

4.8.10.2 American Indian Concerns

Loop C crosses important portions of the Pueblo of Laguna. The Laguna Indians at one point noted that a contemporary shrine was located relatively close to the pipeline centerline. Later clarification by telephone, however, indicated that the shrine was actually outside the mile-wide analysis corridor. Aside from impacts to known ancestral (archaeological) sites listed above, no other specific concerns regarding impacts have been expressed.

Loops D, E and F cross important portions of the Navajo Indian Reservation. The Navajo are concerned about impacts to archaeological and sacred sites, especially burials. Sacred sites include a wide range of types, including the location of sacred plants and animals used in ceremonies. [For a more detailed discussion of types of sacred sites, see the cultural resources technical report]. Some Navajo tribal and chapter representatives expressed concern about impacts to livestock and wish to be informed about fencing and livestock control during the construction period. They are also concerned that the project employ local people. In terms of specific impacts, the original pipeline passed over the southern shoulder of a sacred mountain five miles west of Dilkon and it is hoped that this area can be avoided when laying the proposed expansion Loop F.

Loop I penetrates the eastern part of the Fort Mojave Indian Reservation in Arizona for about 1.5 miles. Tribal elders are concerned that the construction of Loop I may disturb burial grounds that were often located in abandoned channels of the Colorado River. They were also concerned that ancestral (archaeological) sites and ethnographic use areas might be disturbed in that area. The locations of the burial grounds have not been identified.

The Pueblo of Zuni was particularly concerned about impacts to burials along the route. The Hopi Tribe is concerned about impacts to sacred golden eagle nests in the vicinity of Dilkon due to blasting during construction. See also Section 3.7.10.2.

4.8.11 Paleontological Resources

No known fossil localities occur within the corridor of the various loops. Table 4.8-11 lists the impact mileages broken down by impact rating and by separate loop routes.

Table 4.8-11

PALEONTOLOGICAL FORMATION IMPACT MILEAGES,
TRANSWESTERN EXPANSION PROPOSAL

Route Name	Total Route Miles	Impact Mileages		
		Undetermined	Insignificant	Significant
Loop 1	4.1	0.0	4.1	0.0
Loop 2	10.5	0.0	10.0	0.5
Loop A	26.0	0.0	26.0	0.0
Loop B	44.7	3.7	37.6	3.4
Loop C	27.2	0.0	17.7	9.5
Loop D	47.3	0.0	28.8	18.5
Loop E	37.5	0.0	12.9	23.7
Loop F	41.4	0.0	3.4	38.1
Loop G	36.4	0.0	36.5	0.0
Loop H	49.4	0.0	47.3	2.2
Loop I	31.5	0.0	31.5	0.0

A detailed breakdown of the geological formation, the fossils present, and the milepost locations of the formations are discussed in the Paleontological Resources Technical Report [Morales, et al. 1987].

4.8.12 Visual Resources

Refer to Section 4.2.12 for a discussion of the methods employed to assess impacts of the proposed construction on visual resources. Table 4.8-12 provides a summary of impacts to visual resources.

Table 4.8-12

SUMMARY OF VISUAL IMPACTS, TRANSWESTERN EXPANSION PROPOSAL

Milepost	Loop	Jurisdiction	Affected Resource	VRM/VQO	Critical Viewpoint	Visual Impacts (Miles) High 1/	Moderate 1/	Low	None
449-451.5	Loop G	FS	Coconino NF	M	Seldom Seen	-	-	-	x
451.5-455	Loop G	FS	Coconino NF	PR	Seldom Seen	-	-	3.5	
455-457.5	Loop G	FS	Coconino NF	R	Highway 89	-	2.5	-	
457.5-460.7	Loop G	FS	Coconino NF	PR	Highway 89	-	-	3.2	
460.7-461.2	Loop G	FS	Coconino NF	R	Shultz Pass	-	0.5	-	
461.2-466.2	Loop G	FS	Coconino NF	PR	Seldom Seen	-	-	5.0	
466.2-467.5	Loop G	FS	Coconino NF	R	Seldom Seen	-	1.3	-	
467.5-468.8	Loop G	FS	Coconino NF	PR	Seldom Seen	-	-	1.3	
468.8-469.8	Loop G	FS	Coconino NF	R	Highway 180	-	1.0	-	
469.8-476.1	Loop G	FS	Coconino NF	PR	Interstate 40	-	-	6.3	
476.1-480.5	Loop G	FS	Kaibab NF	M	Seldom Seen	-	-	-	x
480.5-481.5	Loop G	FS	Kaibab NF	PR	Forest Rt. 141	-	-	1.0	
481.5-485.5	Loop G	FS	Kaibab NF	M	Seldom Seen	-	-	-	x
613.5-625.5	Loop I	BLM/Phoenix		III	Interstate 40	-	-	12.5	
625.5-630.0	Loop I	BLM/Phoenix		II	Seldom Seen	-	4.5	-	
630.0-631.7	Loop I	BLM/Phoenix		III	Seldom Seen	-	-	1.7	
633.8-636.0	Loop I	BLM/Phoenix		II	Seldom Seen	-	2.2	-	
				TOTAL (Miles) OF VISUAL IMPACT		0.0	12.0	34.5	

1/ Significant Impacts

Loop G

MP 451.5-455, VRM/VQO: FS Class PR
Description: This segment of the route through the Coconino National Forest would create a low visual impact because of existing modifications. The proposed loop would be in a remote area that would be seldom seen. A long-term vegetation recovery rate is anticipated because of slow forest regeneration. These impact are not significant (Figure 4.8-1).

MP 455-457.5, VRM/VQO: FS Class R
Description: This segment of the route through the Coconino National Forest would create a moderate visual impact because of existing modifications. Features of visual significance in the area include the Fort Valley Experimental Forest, Doney Park, and Old Caves Crater. A critical viewpoint for this section of the pipeline is from Highway 89. The proposed route would experience slow rejuvenation and a long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-1).

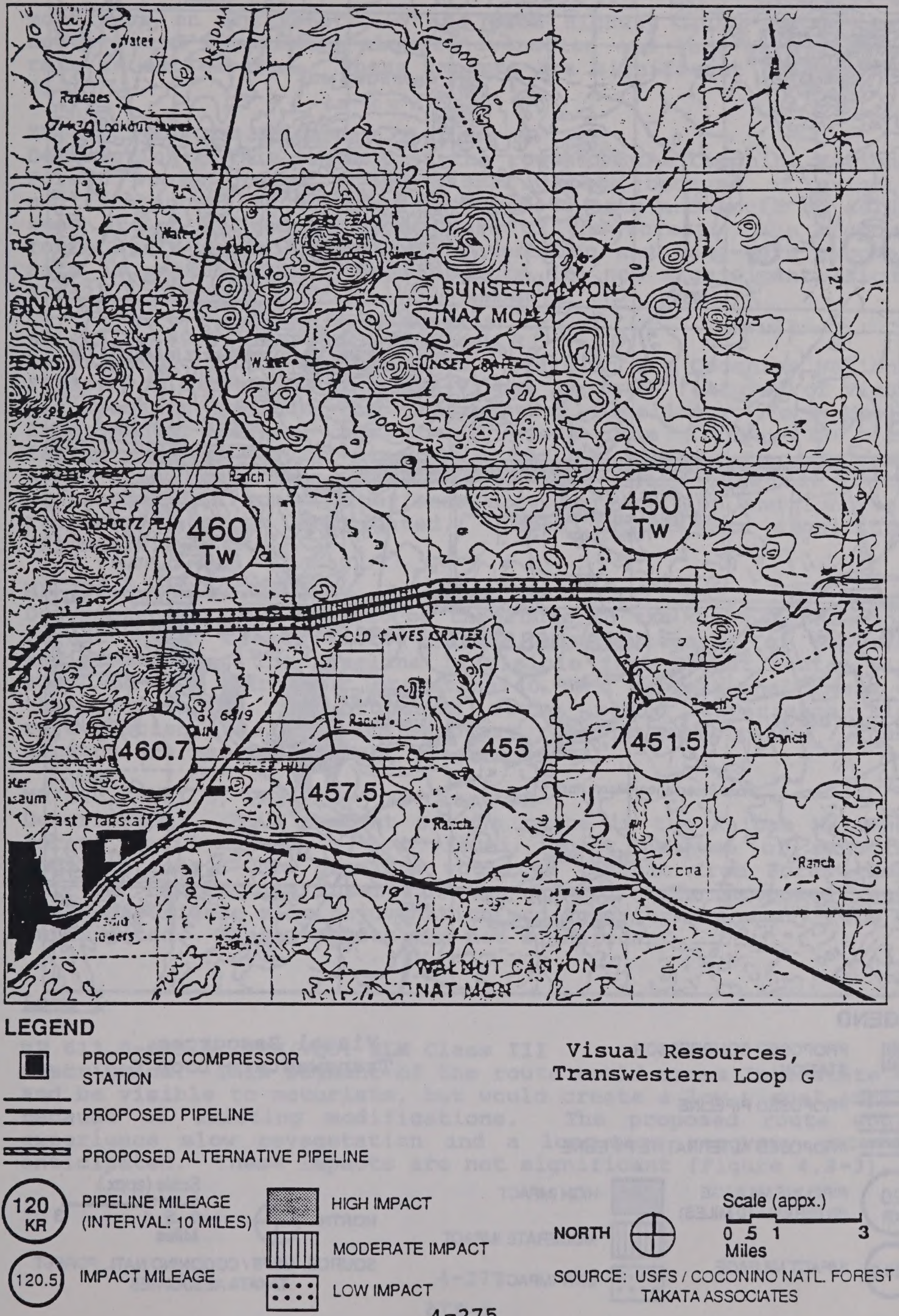
MP 457.5-460.7, VRM/VQO: FS Class PR
Description: This segment of the proposed route in the Coconino National Forest would create a low visual impact because of existing modifications. A critical viewpoint for this segment of the pipeline is from Highway 89. The proposed route would experience slow rejuvenation and a long-term recovery rate is anticipated. These impacts are not significant (Figure 4.8-1).

MP 460.7-461.2, VRM/VQO: FS Class R
Description: This segment of the route in the Coconino National Forest would create a moderate visual impact because of existing modifications. Features of visual significance near the proposed route include the Kachina Peaks Wilderness Area and the scenic drive over Shultz Pass. The pipeline could be seen from Route 420, the scenic road over Shultz Pass. The proposed route would experience slow rejuvenation and a long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-2).

MP 461.2-466.2, VRM/VQO: FS Class PR
Description: This segment of the route in the Coconino National Forest would create a low visual impact because of existing modifications. It would be in a remote area and would be seldom seen with the exception of recreational users of the forest. The proposed route would experience slow rejuvenation and long-term visual impacts are anticipated. These impacts are not significant (Figure 4.8-2).

MP 466.2-467.5, VRM/VQO: FS Class R
Description: This segment of the route in the Coconino National Forest would create a moderate visual impact. Features of visual significance in this area include the Kachina Peaks Wilderness Area, Fort Valley Experimental Forest, Little Leroux Springs, and the scenic drive up the southwestern slope of San Francisco Peak. The pipeline would be visible to east and west-bound

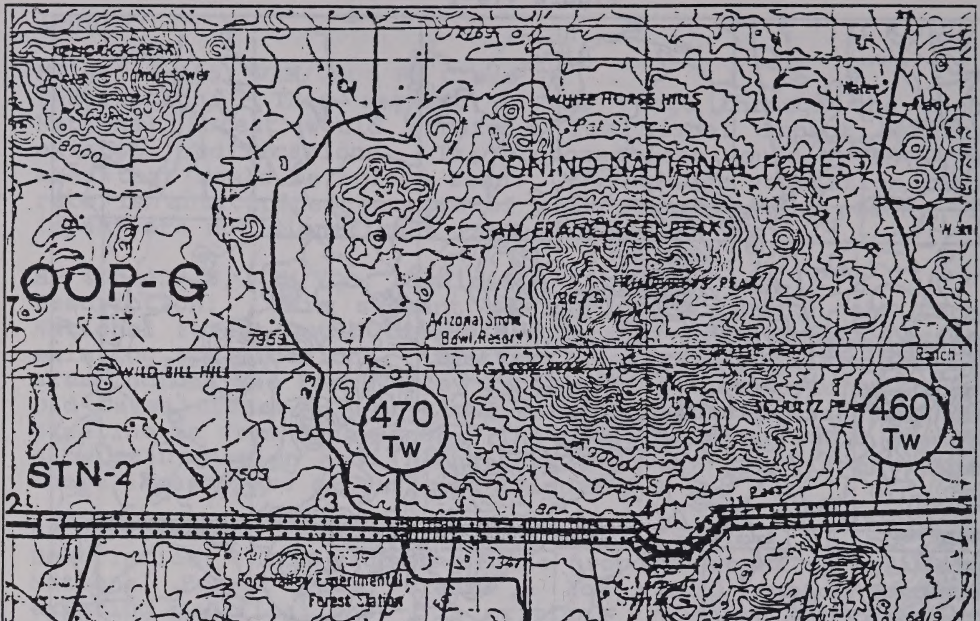
Figure 4.8-1


DEADMAN
Water
Lookout Tower
Water
SUNSET CANYON
NAT MON
SUNSET CRATER
NAL FOREST
PEAKS
6000
7000
Ranch
460
Tw
450
Tw
OLD CAVES CRATER
Ranch
460.7
457.5
455
451.5
6819
Ranch
East Flagstaff
Ranch
Ranch
Radio towers
WALNUT CANYON
NAT MON
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120
KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources, Transwestern Loop G

SOURCE: USFS / COCONINO NATL. FOREST
TAKATA ASSOCIATES

Figure 4.8-2


COCONINO NATIONAL FOREST
SAN FRANCISCO PEAKS
WHITE HORSE HILLS
Arizona Snow Bowl Resort
LOOP-G
STN-2
470 Tw
460 Tw
476.1
469.8
468.8
467.5
466.2
461.2
460.7
FLAGSTAFF
Lowell Observatory
Radio towers
Fort Valley Experimental Forest Station
ATCHISON TOPEKA AND SANTA FE
ARMY DEPOT
Reservation Observatory
Ranch
Ranger station
Filtration plant
Water Museum
Pulliam
17
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources, Transwestern Loop G

SOURCE: USFS / COCONINO NATL. FOREST TAKATA ASSOCIATES motorists on Interstate 40 and from Highway 130. The proposed route would experience slow rejuvenation and long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-2).

MP 467.5-468.8, VRM/VQO: FS Class PR
Description: This segment of the route in the Coconino National Forest would create a low visual impact because of existing modifications. It would be in a remote area and would be seldom seen except by recreational users of the forest. The proposed route would experience slow rejuvenation and long-term recovery rate is anticipated. These impacts are not significant (Figure 4.8-2).

MP 468.8-469.8, VRM/VQO: FS Class R
Description: This segment of the route in the Coconino National Forest would create a moderate visual impact. Features of visual significance include the Transwestern pipeline, Fort Valley Experimental Forest, the scenic views from Highway 180, and Taylor Springs. The pipeline would be visible to north and south-bound motorists from Highway 180. This location of the proposed route would experience slow rejuvenation and long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-2).

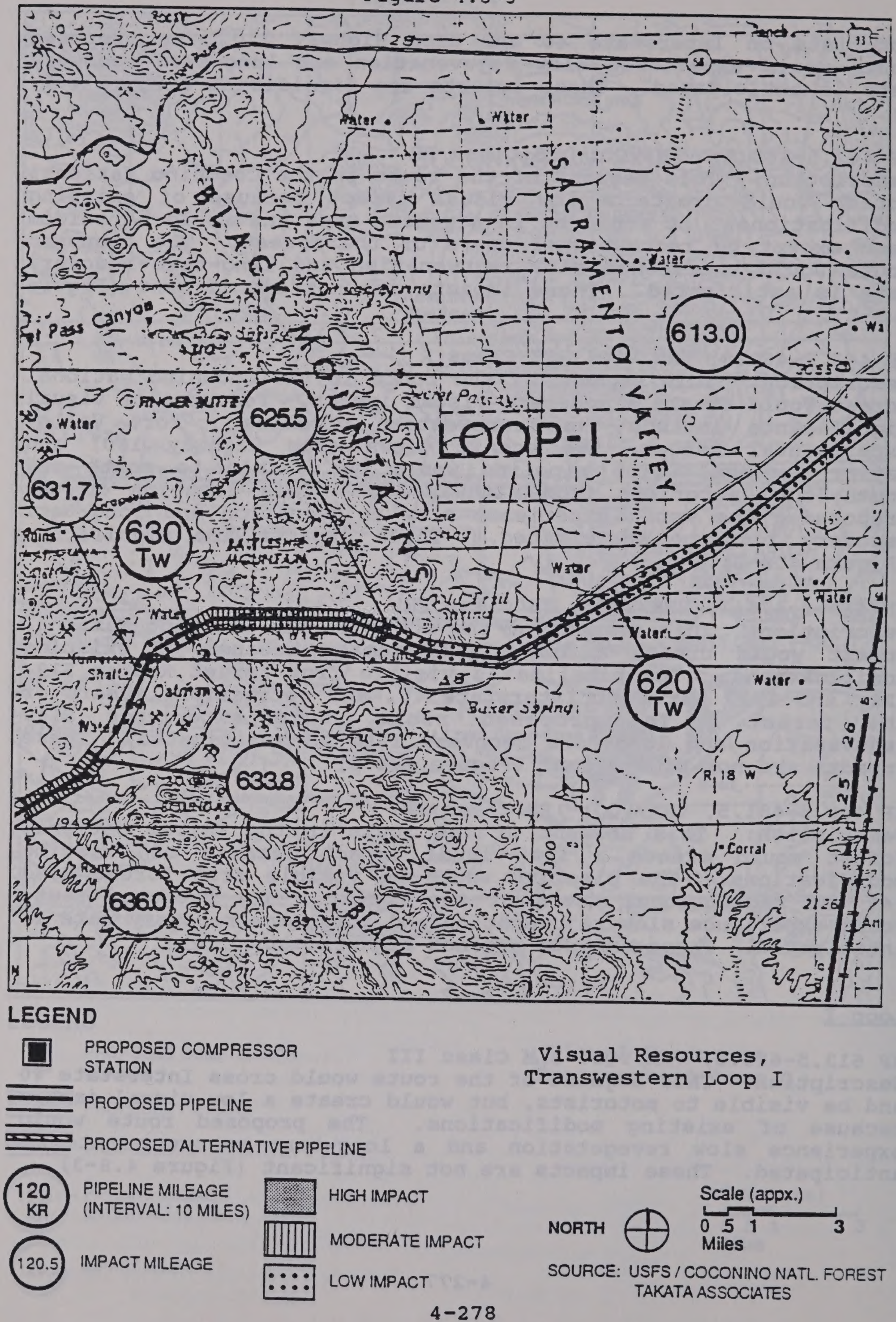
MP 469.8-476.1, VRM/VQO: FS Class PR
Description: This segment of the route in the Coconino National Forest would create a low visual impact because of existing modifications. The pipeline is visible from Forest Routes 519, 222, and 171, parts of Interstate 40, and recreational users of the forest. The proposed route would experience slow rejuvenation and long-term recovery rate is anticipated. These impacts are not significant (Figure 4.8-2).

MP 480.5-481.5, VRM/VQO: FS Class PR
Description: This segment of the route in the Kaibab National Forest would create a low visual impact because of existing modifications. The pipeline would be visible from Forest Road 141 and recreational users of the forest. The proposed route would experience slow rejuvenation and long-term recovery rate is anticipated. These impacts are not significant.

Loop I

MP 613.5-625.5, VRM/VQO: BLM Class III
Description: This segment of the route would cross Interstate 40 and be visible to motorists, but would create a low visual impact because of existing modifications. The proposed route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are not significant (Figure 4.8-3).

Figure 4.8-3


BLACK MOUNTAINS
SACRAMENTO VALLEY
LOOP-I
613.0
625.5
631.7
630
Tw
620
Tw
633.8
636.0
Water
Pass Canyon
RINGER BUTTE
RATTLESNAKE MOUNTAIN
Oatman
Baker Spring
Corral
R 18 W
BLACK
LEGEND
PROPOSED COMPRESSOR STATION
PROPOSED PIPELINE
PROPOSED ALTERNATIVE PIPELINE
120 KR
PIPELINE MILEAGE (INTERVAL: 10 MILES)
120.5
IMPACT MILEAGE
HIGH IMPACT
MODERATE IMPACT
LOW IMPACT
NORTH
Scale (appx.)
0 .5 1 3
Miles

Visual Resources, Transwestern Loop I

SOURCE: USFS / COCONINO NATL. FOREST
TAKATA ASSOCIATES

MP 625.5-630, VRM/VQO: BLM Class II
Description: This segment of the route would create a moderate visual impact. The proposed line would be in remote area and would be seldom seen except by people living in Oatman. The proposed route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-3).

MP 630-631.7, VRM/VQO: BLM Class III
Description: This segment of the route would create a low visual impact because of existing modifications. The pipeline would be in a remote area and would be seldom seen except by the people living in Oatman. The proposed route would experience slow rejuvenation and a long-term recovery rate is anticipated. These impacts are not significant (Figure 4.8-3).

MP 633.8-636, VRM/VQO: BLM Class II
Description: This segment of the route would create a moderate visual impact because of existing modifications. The pipeline would be in a remote area and would be seldom seen except for people living on private ranches in the area. The proposed route would experience slow revegetation and a long-term recovery rate is anticipated. These impacts are significant (Figure 4.8-3).

4.8.13 System Safety and Reliability

In general the proposed Transwestern loops are through uninhabited areas. The following dwellings have been identified as being near the proposed pipeline right-of-way.

Loop D MP 225.8 - trailer house - 50', barn - 4'
- doublewide mobile home - 150'
- house - 75'

MP 234.5 - metal building - 150'
MP 258.0 - trailer house - 103', barn - 51'

Loop E MP 503.4 - hogan - 48', house - 95'

Loop G MP 481.5
to 482.5 - house - 106', house - 58'; house - 103';
house - 86'; house - 92'; house - 62';
house - 112'; house - 98'; house - 90';
house - 78'

Subsidence from seismic events or coal mining could be a problem on all loops. There are slope stability problems on Loops C through H. The only area where fault rupture may be a problem is at MP 177-179 (Loop C).

Additional information on system safety and reliability can be found in Section 4.2.13.

4.9 CUMULATIVE IMPACTS

4.9.1 Mojave Proposal

Cumulative impacts result when a project is added to an area in which other developments exist or are proposed. Although the impacts from the separate projects might be minor, the impacts from all projects in an area could be significant. The interrelated projects presented in Chapter 2 along with the Mojave project were analyzed for cumulative impacts.

The only resources which would sustain measurable cumulative impacts from the addition of the Mojave proposal would be vegetation, wildlife, socioeconomic and visual resources. Vegetation resources could be affected in various ways by an accumulation of habitat loss in the immediate vicinity of the Celeron All American pipeline. The All American pipeline route would be closely followed by the Mojave pipeline between the Tehachapi Mountains and the Old Woman Mountains. The cumulative affects on vegetation loss in the area would be significant to the Mojavean creosote bush scrub community since regeneration of this vegetation community would be a slow process.

The same portion of the route would also have a cumulative affect on wildlife species, particularly the desert tortoise. Desert tortoise habitat begins at the eastern edge of the Tehachapi Mountains and would extend to the point of diversion between the two routes around the Old Woman Mountains. The affects on desert tortoise habitat reduction and the potential for impacting significant numbers of desert tortoise could almost be doubled.

In addition to these impacts to vegetation and wildlife caused by the All American project, the Mead/McCullough-Victorville Adelante transmission project would impact similar types of habitat although the route would rarely occur in exactly the same areas as the two pipeline projects. However, the cumulative affects to the habitats would be significant.

The USFWS is aware of several other projects in the San Joaquin Valley where biological surveys have documented the occurrence of the blunt-nosed leopard lizard, giant kangaroo rat, or San Joaquin kit fox. (See Appendix G for a listing of these projects.) The cumulative effects of these known actions pose a significant threat towards the eventual recovery of these species. Taken collectively, all land modifying projects within the area threaten the continued existence of these species. The construction and use of the Mojave Pipeline will significantly contribute towards this erosion of extant wildland habitats and reduction in listed species populations.

Additional cumulative impact that could result from these projects would be in the area of socioeconomics. The employment requirements, housing needs, transportation need and increased tax benefits would be interrelated. Employment requirements for the power project added to those for Mojave discussed above could probably put a strain on the available employment market, particularly in the isolated areas between the Tehachapi Mountain and Old Woman Mountains. The All-American project will be completed before Mojave begins. These employment impacts would be short-term, less than one year. The longer term impacts involved with operation and maintenance should not cause problems.

Housing needs on a temporary basis may result in a short-term shortfall. If the two projects were in construction simultaneously, the affects on the temporary housing market in most of the towns along the route would be stressed. Again this would be a short-term impact. The variations in construction schedules may moderate but not eliminate the shortage in worker housing.

Transportation needs would also produce a short-term cumulative impact. If construction schedules were to coincide increased traffic particularly in Barstow and north Edwards areas may cause some traffic delays. Again variations in construction schedules may moderate but not eliminate the traffic delay.

Cumulative impacts to the tax base in San Bernardino County would be significant. Taken separately, none of the projects would cause a significant increase to the tax base. However the cumulative affects of three major projects within this portion of San Bernardino would significantly lower the tax burden to the resident population.

Impacts to visual resources would increase in a cumulative manner. The Mojave line would parallel portions of both the All American pipeline thus increasing the width of ROW disturbance. These impacts however would not be in areas which would have outstanding scenic value. They would however be more permanent intrusions due to the length of time required for regeneration of vegetation.

These visual impacts coupled with the transmission towers of the Mead-Victorville transmission project would draw attention to the pipeline ROW.

Implementation of the project could potentially destroy some unknown subsurface historic or prehistoric remains. There could be a loss of knowledge because any sites excavated as a result of the project would be precluded from future scientific studies. This would be particularly significant in the Mojave desert where current information on cultural adaptations is scarce.

These same types of cumulative impacts would also occur with paleontological resources. Again knowledge of formations and research in the area have not been particularly well studied. Losses to formations prior to detailed studies may result to data gaps which cannot be recovered.

4.9.2 El Dorado ~~Proposal~~ Alternative

Cumulative impacts resulting from the construction of the El Dorado proposal would be similar to those discussed for Mojave (see Section 4.9.1).

4.9.3 El Paso Proposal

The cumulative affects to the El Paso Alternative 600 MMcfd case would be tied to the construction of the Boulder City to Phoenix transmission project. The transmission line routing would cross the expansion for this case only. The main cumulative affects of these projects would revolve around socioeconomic impacts similar to those discussed for the Mojave proposal. Cumulative impacts to the workforce, housing and the tax base in the isolated region of construction would be significant. These impacts would be short-term in nature and could be partially alleviated by changes in the construction schedule.

4.9.4 Transwestern Proposal

Cumulative impacts resulting from the construction of the Transwestern proposal would be similar to those discussed for El Paso (see Section 4.9.3).

4.10 PLANNED AND RECOMMENDED MITIGATION MEASURES

The following section presents mitigation measures proposed by the applicants and recommended by staff. In order to prevent repetition of mitigation measures certain disciplines will not have all measures discussed since the measures would be appropriate for more than one discipline. In Section 4.10.6, federal land management agency-recommended measures are presented. Site-specific measures and stipulations for actual pipeline construction and operation activities on federal lands would be developed by federal land management agencies after certification by the FERC. ~~For species of special concern, the certificated applicant(s) shall implement all mitigation measures formulated during the formal consultation between the FERC staff and the Fish and Wildlife Service pursuant to the Endangered Species Act.~~ [Bracketed words following a mitigation measure indicates the source(s) of the measure.]

Staff also recognizes that during the course of the on-going FERC hearings, which commenced September 9, 1987, Mojave has testified that they are willing to make and/or have made route modifications to their proposed routes in order to eliminate most of the land use and recreation impacts addressed in this Final EIR/EIS. Most of these route modifications were previously recommended in the Draft EIR/EIS. For example, Mojave has testified that they have already made specific route modifications which would eliminate impacts to Tehachapi Mountain Park, Kern River County Park, and the residential areas of Stallion Springs and Indian John Spring. The modifications would also put the proposed route back in BLM utility corridors from which it deviated and also place the route outside of property owned by Edwards Air Force Base thereby eliminating this land use conflict. Although commitments have been made by Mojave, Staff has retained its previous recommendations to avoid these land use and recreational impacts in the Final EIR/EIS. There is also one route modification near the beginning of the Kern Lateral which is outside the 1-mile corridor studied in this EIR/EIS. This route modification is less than 1-1/2 miles long and is less than 1/2 mile outside the studied corridor. With the possible exception of impacts to biological and cultural resources, the impacts are expected to be minor. With respect to biological and cultural resources, staff's mitigation measures, which require further studies for these resources, should mitigate impacts to these resources.

4.10.1 Mitigation Measures

4.10.1.1 Air Quality

Applicant Proposed Measures

General Impact: High dust levels would be present during construction.

1. Mitigation: The applicant plans to water the ROW to keep dust down to a manageable level. [Mojave/El Dorado/ Transwestern]

   Effectiveness: This would reduce some of the impacts of inert pollutants; however, additional mitigation measures presented below could further reduce impacts to acceptable levels.

General Impact: Construction vehicle emissions would be in excess of stationary source levels.

2. Mitigation: Construction emissions would be mitigated through proper maintenance of construction equipment, and by maintaining manufacturer-installed exhaust systems for construction emissions. [Mojave/El Dorado/Transwestern]

   Effectiveness: Maintenance of emissions equipment would reduce construction vehicle exceedances.

Staff Recommended Measures

General Impact: High vehicle emissions would be present during construction.

3. Additional Mitigation: The predicted effect of exceedances could be mitigated if public access is restricted to outside a few hundred foot wide buffer zone. This would only be necessary in populated areas in California. This type of measure could be imposed by the State of California during the final permitting process.

4. Additional Mitigation: Impacts shall be reduced by optimizing air-to-fuel ratios and retarded ignition timing on construction vehicles. This could reduce NO_x emissions by up to 30 percent.

   Effectiveness: These recommended measures would further reduce vehicle emissions and/or impacts during the construction phase.

4.10.1.2 Geology

Applicant Proposed Measures

General Impact: Geologic and seismologic hazards may result in damage to the pipeline and related facilities, and significant indirect effects.

5. Mitigation: Detailed geologic, seismologic, and geotechnical studies would be conducted by the applicant to identify and characterize geologic hazards as appropriate along the Mojave Proposal. In areas where hazards are identified, information would be collected to aid in the design and construction of the pipeline and ancillary facilities. Emphasis would be placed on arroyo crossings to protect the pipeline from flash floods and to prevent erosion of the trench backfill material near arroyos. In general, care would be taken during construction to minimize surface disturbance and related soil erosion, and not to alter the drainage of the affected area. [Mojave]

   Effectiveness: These studies would identify potentially hazardous areas and would allow for development of specific pipeline design criteria.

6. Mitigation: Additional studies would be conducted by the applicant to evaluate potential seismological hazards along the proposed Mojave Mainline and Kern Lateral routes. The potential for surface offset along the Quaternary faults listed in Tables 3.1-6 and 3.1-7 would be evaluated in detail so that appropriate pipeline crossings can be designed. Field studies would be completed to delineate the

areas where movements may occur. An emphasis would be placed on studies of the Garlock and White Wolf faults, and in the southwest portions of the San Joaquin Valley where the proposed mainline route is located close to the San Andreas fault. Ground motion parameters would be developed for use in the seismic design of the pipeline and ancillary structures. [Mojave]

In areas where blasting would be required during trenching operations, pre-construction seismographic tests would be conducted to determine the potential for vibration to cause compaction/settlement in the adjacent existing West Texas Lateral or Transwestern Mainline trenches. During blasting operations, the adjacent West Texas Lateral and Transwestern Mainline trench areas would be monitored to ensure the extent of potential compaction/settlement resulting from blasting-related vibration does not pose a substantial threat to the structural integrity of the existing pipeline. [Transwestern]

Effectiveness: Identification of active faults would permit development of specific design criteria which would minimize the hazards of fault rupture.

7. Mitigation: Accepted industry construction standards would be used to mitigate potential damage due to geological factors. [El Dorado]

Effectiveness: Utilization of these standards would help to identify areas with the potential to cause pipeline damage and specific design criteria would be employed. These steps would help to reduce the possibilities of pipeline damage caused by geological factors.

8. Mitigation: The topography of the corridor would be restored to near its original contour. [El Dorado]

Effectiveness: Restoration of the pipeline corridor would reduce the potential for erosion and would help to control landslides.

9. Mitigation: Slack in the pipeline would be added at fault crossings. Other special methods, including the use of padded ditch and heavy wall pipe, would be considered on a site-specific basis. [El Dorado]

Effectiveness: If properly implemented, this measure would reduce the potential for a pipeline rupture caused by fault movement.

General Impact: Hydrocompaction and subsidence may occur along portions of the route.

10. Mitigation: The construction of the ~~proposed Mainline and Kern Lateral~~ pipeline would probably not introduce water that might cause hydrocompaction; however, care would be taken during construction not to disturb the drainage of the affected area and to avoid producing any depressions in which water would be allowed to pond. [Mojave/Transwestern]

    Effectiveness: These measures would adequately mitigate the potential for hydrocompaction and subsidence.

General Impact: Unstable slopes may result in landslides which could result in a pipeline rupture.

11. Mitigation: Field studies would be completed to locate and characterize potentially unstable slopes and other surficial features.~~ including sand dunes~~. Monitoring and surveillance programs would be implemented, if necessary. [Mojave] Known landslide areas where new construction could jeopardize prior existing rights should be avoided. [Staff]

    Effectiveness: This measure would result in reducing the potential of pipeline rupture if specific design criteria are implemented.

General Impact: Volcanic activity may cause damage to the pipeline.

12. Mitigation: The volcanic cinder cones present near Amboy and Hector would be investigated to estimate the potential for an event that would affect the Mojave Mainline and allow contingency planning. [Mojave/Staff]

    Effectiveness: Identification of areas with a significant likelihood of volcanic activity would allow ~~consideration of a rerouting of the pipeline~~ contingency planning.

Summary of Effectiveness of Planned Mitigation Measures: These mitigation measures should reduce geologic impacts to acceptable levels. In addition to these measures, the Environmental Staff recommends that the following measures also be employed.

Staff Recommended Measures

General Impact: Geologic and seismologic hazards may result in damage to the pipeline and related facilities, and significant indirect effects.

13. Additional Mitigation: Results of the applicant's geotechnical studies indicated in Nos. 5, 6, and 11 above, shall be submitted for review and approval. The following geotechnical studies and mitigating design measures shall be submitted for review and approval by the FERC staff prior to implementation of these measures. Such studies shall include identification of: (a) all Holocene faults crossed by the proposed facilities; (b) all areas where potentially liquefiable deposits are crossed and likely effects on the facilities; and (c) all landslides or areas of significant slope instability crossed by, or possibly affecting, the proposed facilities.

Specific mitigating measures shall be developed to minimize the potential for slope failures, ruptures or failure of pipeline facilities wherever such failure could result in direct or indirect hazards to public safety and environmental resources. The nature and locations of significant geologic hazards shall be considered in the siting of mainline block-valves. The applicant shall also consider use of automatic or remote-controlled block valves in areas which may be inaccessible following a major earthquake or landslide.

Studies shall be done in sufficient detail to allow characterization of the particular geologic hazard using state of the art techniques. Sufficient justification shall be included for not implementing specific mitigating measures in areas identified as subject to significant geologic hazards.

Effectiveness: Studies will minimize potential for slope failures and ruptures and identify fault locations.

General Impact: Mass failure of vertical streambanks may result in exposure of and subsequent damage to pipeline.

14. Additional Mitigation: Where necessary to protect pipeline from exposure, place riprap or other acceptable streambank erosion control structures on the outside bends of streams with high vertical banks.

Effectiveness: Use of streambank erosion control structures at critical locations would reduce the changes which could cause mass streambank failure and possible exposure of the pipeline.

General Impact: Volcanic activity may cause damage to the pipeline.

15. Additional Mitigation: Volcanic cinder cones shall be investigated to estimate the potential of an event that could effect the Mojave and El Dorado Projects.

Effectiveness: Identification of areas with a ~~significant~~ likelihood of volcanic activity would allow contingency planning.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Implementation of these mitigation measures would reduce geologic impacts to acceptable levels and would result in a pipeline which would not be as susceptible to landslides or fault ruptures as it would be if these potential hazards were not taken into consideration.

4.10.1.3 Soil

Applicant Proposed Measures

General Impact: Loss of topsoil.

16. Mitigation: Selective salvage and replacement of topsoil (A horizon) for ~~agricultural~~ cultivated lands and those lands for which the land management agency or the landowner requests that topsoil be salvaged and replaced or on lands underlain soils by poorly suited or with unsuitable reclamation potential. Topsoil shall not be used for filling of sack breakers or for padding in the trench. [Mojave/El Dorado/El Paso/Transwestern/Staff]

Effectiveness: Decrease potential loss of productivity due to loss of topsoil or mixing of topsoil with less suitable subsoil material.

General Impact: Removal of vegetative cover or desert pavement resulting in increased erosion.

17. Mitigation: To limit steepness or length of slopes erosion control features, such as water bars, collection ditches, terraces, rock mulch (riprap), sand bags, or straw bales would be used for temporary or permanent control. [Mojave/El Paso/Transwestern]

Effectiveness: Decrease erosion by water. Effectiveness of mitigation measure would depend upon site-specific design and installation. Intensive application would be needed on steep slopes with high erosion probability if erosion is to be effectively controlled on a long-term basis.

18. Mitigation: Preparation of surface to receive seed, including surface roughening and tilling across slopes, and seeding with native grass, adapted grass or other plant species, as recommended by land management agencies/landowner. [Mojave/Staff]

Effectiveness: Decrease erosion by wind and water. Re-establishing vegetative cover within a short period of time would decrease the time soil is exposed to erosion.

19. Mitigation: Mulching with hay or straw, or restoration of desert pavement conditions. Crimping of hay or straw mulch into the soil on the contour or tacking netting over an organic mulch shall be done on a site-specific basis in consultation with jurisdictional land management agencies or landowners. [Mojave/Transwestern/Staff]

Effectiveness: Decrease erosion by wind and water and enhance revegetation by stabilizing soil and conserving moisture.

20. Mitigation: Minimize the amount of vegetation removed, and where it is removed, leaves the roots intact. [El Dorado]

Effectiveness: Decrease erosion potential by water and maintain mechanical support within the soil. Minimize the area of disturbance and the area that would require reclamation.

General Impact: Reduction in soil productivity.

See mitigation measures 16, 17, 18, and 19.

Effectiveness: All of these measures contribute to maintaining soil productivity.

21. Mitigation: Addition of soil amendments, including fertilizer, and use of appropriate seeding methods to aid in the development of a positive growth medium where deemed necessary through consultation with land management agencies or private land owners. [Mojave/Transwestern/Staff]

Effectiveness: Improve rate of vegetation reestablishment. Use of appropriate seeding methods would enhance vegetation re-establishment on all sites. Soil amendments, such as fertilizer, would generally obtain a positive response where moisture is not limiting, such as irrigated cropland or higher rainfall zones.

General Impact: Soil Compaction.

See mitigation measure 18.

Effectiveness: Loosen soil compaction caused by equipment traffic. Tillage (or ripping) must loosen all of compacted layers to be fully effective in improving water intake, permeability, and suitability of soil as a plant growth medium. [Mojave]

General Impact: Reduced utility of the land and loss of soil and vegetation resources.

22. Mitigation: Develop and successfully implement runoff, erosion, reclamation, and revegetation plans for specific segments of the pipeline with similar environmental conditions. The details on the specific types of measures that might be implemented are presented in Bechtel [1986]. The plan would include monitoring and follow-up maintenance should a problem be identified during monitoring. [El Dorado]

Effectiveness: The magnitude and cumulative amount of impact to soil resources and associated resources would be reduced. In most locations, the potential for significant impact would be greatly reduced, assuming the plan is successfully designed and implemented. In some locations even the most prudent and well-designed and implemented plans would not remove the potential for significant impact due to high erosion potential or poor revegetation potential that is not controllable.

General Impact: Wind erosion and dust.

23. Mitigation: The applicant would apply dust control measures during pipeline construction. Wind erosion would be curtailed by prompt revegetation of the pipeline ROW. [El Dorado]

Effectiveness: Wind erosion and fugitive dust would be reduced to non-significant levels.

General Impact: Cumulative disturbance of soils.

24. Mitigation: Minimize the areas of disturbance to a minimum necessary to construct and operate the pipeline. Avoid particularly sensitive areas prone to significant impact and avoid steep slopes, where practicable. [El Dorado/Staff]

Effectiveness: Cumulative impacts would be reduced.

Summary Effectiveness of Planned Mitigation Measures: The proposed mitigation measures would reduce or eliminate most impact that would occur due to pipeline construction. However, some exceptionally steep slopes or areas of exceptionally poor reclamation potential may continue to suffer significant impact even after prudent measures have been applied. In these cases areas with severe erosion or revegetation problems should be avoided.

The proposed mitigation measures have the capability of controlling erosion within acceptable limits, maintaining productivity on agricultural lands, and re-establishing vegetation on many areas. Some rangeland soils with loamy, nonsaline/nonalkaline surface layers over hard to soft bedrock, hardpans, saline/alkaline layers, sand or gravel at shallow to moderate depths will have significant revegetation problems if the surface soil is mixed with the subsoil material.

Staff Recommended Measures

General Impact: Loss of topsoil

25. Additional Mitigation: Materials unsuitable for backfilling or excess backfill material shall be disposed of by environmentally acceptable measures as arranged by the land management agency or landowner.

    Effectiveness: Backfill will be properly disposed of.

General Impact: Removal of vegetative cover or desert pavement resulting in increased erosion.

26. Additional Mitigation: Minimize the time interval between clearing, construction, and reseeding.

    Effectiveness: Decreases time bare soil is exposed to erosion, and decreases potential soil loss to erosion.

27. Additional Mitigation: During construction of the project, an on-site reclamation specialist, certified by the Soil Conservation Society of America, shall be employed by the company for each construction spread to provide direct applicable restoration procedures when special conditions are encountered, without causing construction delays and to provide liaison with the FS/BLM officials.

28. Additional Mitigation: Soil areas with rock fragments, such as very coarse gravel, cobble or stone scattered on the surface or desert pavement conditions shall be restored as nearly as possible to the original pre-construction surface condition to blend with the adjoining area, to

avoid a smooth surface ROW area, and to control accelerated erosion.

Effectiveness: Accelerated erosion will be controlled and coordination between land management agencies will be established.

General Impact: Accelerated soil erosion.

29. Additional Mitigation: Where practical, as determined by the appropriate regulatory agency, the pipeline shall be located on sideslopes of less than 30 percent.

30. Additional Mitigation: Cultivation and land preparation operations on steeply sloping areas shall be done on the contour to minimize erosion.

Effectiveness: Water erosion potential would be decreased and probability for successful revegetation will be improved.

31. Additional Mitigation: Fencing of ROW through rangeland shall be done, subject to site-specific analysis and/or negotiation with the landowner/land management agency, to allow undisturbed re-establishment of vegetation. In the absence of recommendations on the location of crossovers from local land managers or permittees, crossovers shall be located every 500 yards. Fencing of disturbed riparian areas in non-rangeland will be required to prevent grazing damage from big game to newly established vegetation.

Effectiveness: This procedure should allow for re-establishment of vegetation within one to three years, much more quickly than would normally occur if grazing were unchecked.

General Impact: Ineffective stabilization and reclamation on federal lands.

32. Additional Mitigation: On federal lands, a detailed site-specific geotechnical and restoration and reclamation plan shall be developed and become part of the Forest Service/ Bureau of Land Management construction, operation, and maintenance (COM) plan. Because the proposed ROW is composed of many types of terrain, soils, water, bedrock, vegetation, land uses, and climatic conditions, the detailed plan shall include sets of techniques and measures tailored to each condition encountered. Local expertise and locally effective slope stabilization and reclamation methods shall be followed when the site-specific procedures for the detailed plans are developed. Site-specific geotechnical and erosion control, revegetation, and

restoration measures from the plans shall be implemented under the direction of the appropriate agency official. Consultation with all appropriate state and federal agencies and other local experts will be required when developing detailed site-specific revegetation plans.

33. Additional Mitigation: All topsoil on federal lands shall be conserved for reclamation requirements unless otherwise directed by the FS/BLM; excess topsoil shall be stockpiled at designated locations. Topsoil shall be removed, windrowed separately, protected, and replaced last during backfilling.

34. Additional Mitigation: During adverse weather conditions, as determined by the FS/BLM authorized officer, stop and start orders on federal lands shall be issued to prevent rutting or excessive tracking of soils and deterioration of vegetation in the ROW area.

35. Additional Mitigation: On all federal lands, design and construction of all temporary, reconstructed, and newly constructed roads shall be based on an approved COM plan transportation section and shall ensure proper drainage, minimize soil erosion, and preserve topsoil. This plan shall include clearing work, rehabilitation, and use and maintenance agreements associated with transportation needs.

Where possible, the ROW itself shall be used as an access road during the construction period. The FS may require that the access roads paralleling this pipeline be closed and vegetative cover re-established after pipeline construction is completed and may not permit maintenance roads along the pipeline route.

Overland access may be specified in lieu of road construction or reconstruction.

All temporary roads shall be closed and areas restored without undue delay or maintained as specified in the ROW grant(s) or special use permit(s). Restoration to near original slope and contour, including redistribution of topsoil, would be to the satisfaction of the appropriate land management agency.

36. Additional Mitigation: On federal lands, a specific trenching and excavated material stockpiling procedure shall be used on steep-sloping and rough, broken terrain to ensure ~~maximum~~ minimum disturbance as outlined in the FS/BLM COM plan.

37. Additional Mitigation: On federal lands, temporary work space areas used at highway and stream crossings and other special sites shall be restored to approximate pre-

construction conditions and to the satisfaction of the FS/BLM.

38. Additional Mitigation: ~~Chiseling shall be used, unless objected to by the FS/BLM, in federal range land areas to reduce compaction and improve soil permeability. Pitting and contour furrowing as directed by the FS/BLM shall be done on steeper slopes of disturbed areas to increase infiltration and to reduce runoff and erosion.~~ To reduce compaction and improve soil permeability in rangeland areas, the ROW shall be scarified or chiseled where needed. Contour furrowing, terracing, water barring, etc., as directed by the FS/BLM or landowners shall be done on steeper slopes to increase infiltration and to reduce runoff and erosion.

Effectiveness: These measures should provide effective stabilization and reclamation on federal lands.

Summary of Effectiveness of Staff Recommended Mitigation Measures: The available mitigation measures would further control erosion within acceptable limits. Impacts to soils with regard to revegetation would be further reduced by the available mitigation measures; however, significant impacts would still occur with regard to loss of topsoil and accelerated erosion until reclamation activities were effective.

4.10.1.4 Surface Water

Applicant Proposed Measures

General Impact: Increased surface runoff, erosion, and off-site sedimentation associated with ROW clearing, construction within, operation, and abandonment of the ROW.

39. Mitigation: During pipeline construction across stream channels, construction contractors would minimize time of disturbance and area disturbed. Construction impacts would not exceed two weeks. Periods of low flow would be utilized when crossing stream channels. [Mojave]

Effectiveness: The potential increase in surface water runoff, erosion, and off-site sedimentation from the ROW would be reduced since the area of disturbance and the duration of increased runoff, erosion, and off-site sedimentation would be reduced.

40. Mitigation: After pipeline construction is completed, construction contractors shall stabilize disturbed areas promptly. [Mojave]

Effectiveness: Stabilization of disturbed areas would reduce runoff, erosion, and off-site sedimentation.

41. Mitigation: ~~The applicant~~ El Dorado presents a comprehensive mitigation plan [Bechtel, 1986] to eliminate the potential for impacts or reduce impacts to the surface water environment to an acceptable level. The plan addresses mitigation of most types of general impacts that could occur due to pipeline construction. [El Dorado]

    Effectiveness: In general, the successful implementation of these measures would be adequate for most types of impacts. However, the potential that some impacts would remain or occur even with the prudent implementation of the measures indicates that additional measures would be required.

42. Mitigation: The applicant shall develop and implement site-specific erosion control, revegetation, and stabilization plans as soon as possible to limit soil erosion and potential sediment input. This plan must be acceptable to the appropriate regulatory agency. In addition to this plan, an anti-degradation analysis of water quality should be undertaken to assure that the highest statutory and regulatory requirements and best management practices for pollutant controls are achieved. [Transwestern/Staff]

    Effectiveness: Reduction in the quantities of runoff, erosion, and off-site sedimentation to acceptable levels in most, but not all, situations. The actual response would depend on the intensity and type of measures implemented, and the performance in implementing the measures.

General Impact: Reduced water quality, increased sediment loading, and aggradation and degradation of stream channels due to channel bed disruption in response to constructing pipelines through stream channels.

43. Mitigation: The pipeline shall be buried at stream crossings below the estimated scour depths associated with a 100-year flood event. Where channel degradation during operation reduces the burial depth to less than the 100-year scour depth, ~~reburial of the pipeline to the proper depth shall be required~~ the applicant shall ensure the integrity of the pipeline through reburial to the proper depth wherever feasible. Where reburial is not practicable other methods such as installation of anchors and riprapping shall be employed. [Mojave/Staff]

    Effectiveness: ~~Burial~~ Reburial or reinforcement of the pipeline would reduce potential for exposure of pipe during operation.

44. Mitigation: Pipeline operators would check the pipeline burial depth periodically at stream channel crossings. [Mojave]

Effectiveness: Periodic checks of depth of burial would determine whether scouring processes are taking place which could eventually expose the pipeline.

45. Mitigation: At crossings where channel degradation has reduced the burial depth to less than the 100-year scour depth, reburial of the pipeline to the proper depth would be required. [Mojave]

Effectiveness: Reburial of the pipeline when necessary would ensure against possible damage to the pipeline, thus preventing possible failure. In addition, this measure would greatly reduce impacts to the channel bed associated with an exposed pipeline.

46. Mitigation: Measures to minimize stream bank and stream bed disturbance to the extent practicable. [Transwestern]

Effectiveness: If properly implemented, these measures would substantially reduce additional sediment loading into the stream and therefore, greatly reduce the potential for significant impact.

47. Mitigation: Measures to reduce impacts to the stream channel and water quality and quantity include burying the pipeline loops below estimated scour depths at stream crossings. [Transwestern]

Effectiveness: These measures would reduce the potential for exposures of the pipe during operation.

General Impact: Impacts associated with the withdrawal and discharge of water used in hydrostatic testing of the pipeline.

48. Mitigation: If required by State of Federal discharge permits, hydrostatic test water would be tested and treated, as necessary, before release. [Mojave/El Dorado/El Paso/Trans-western/Staff]

Effectiveness: This measure would mitigate the potential for reduced stream water quality.

49. Mitigation: Hydrostatic test water ~~would also~~ shall be released in a controlled manner to reduce the potential for scour if discharged into natural waterways. [Mojave/El Dorado/El Paso/Transwestern/Staff]

Effectiveness: This measure would reduce the potential for scouring and erosion of soils, and reduced stream water quality. However, these measures alone may not be sufficient to reduce potential impacts to non-significant levels.

Summary of Effectiveness of Planned Mitigation Measures: The proposed mitigation measures would go a long way toward reducing potential impacts to acceptable, non-significant levels. However, the potential for continued significant impact exists even if the proposed mitigation measures were implemented.

Staff Recommended Measures

General Impact: Increase surface runoff, erosion, and off-site sedimentation associated with ROW clearing, construction within, operation, and abandonment of the ROW.

50. Construction across intermittent and perennial streams shall be done during periods of low or no flow where practicable. Stringent water quality control measures shall be utilized on crossings made during moderate to high flow periods. Construction impact should not exceed two weeks.

Effectiveness: Reduction of impacts associated with pipeline construction across streams. However, in streams with moderate to high sensitivities due to channel gradients these measures would not be sufficient to reduce impacts to levels that are not significant.

General Impact: Reduced water quality, increased sediment loading, and aggradation and degradation of stream channels due to channel bed disruption in response to constructing pipelines through stream channels.

51. Additional Mitigation: Coffer dams shall be ~~used for all perennial stream crossings with moderate to high sensitivities due to channel gradient. They shall also be used to permit flow in one part of a stream while pipe laying construction occurs in another part~~ utilized where necessary and their specific use shall be determined based upon the analysis of specific stream crossings, detailed engineering design and consultation with the Army Corps of Engineers.

Effectiveness: The use of coffer dams would reduce the short-term impact of in-stream trenching and resultant water turbidity. ~~impacts to the stream environment. Without flow, more attention could be conveniently given to backfilling the trench to meet pre-existing conditions thus minimizing the opportunity of aggradation and degradation. Further, the lack of flow would eliminate most of the sediment disturbed and entrained by flow during excavation~~

~~and backfilling. Sediment transport would be greatly reduced thus reducing the potential for significant impact.~~

52. Additional Mitigation: Measures to be used to reduce impacts to the stream channel and water quality and quantity include the following:

- o Stream crossings shall be made as perpendicular to the axis of the channel as possible.
- o Spoil from trench excavation shall be placed out of the stream on the banks at narrow stream crossings.
- o Spoil shall be carefully placed downstream of the trench at wide crossings.
- o Backfilling shall be performed slowly to minimize agitation and increased sediment loading.
- o Provide good quality backfill for placement in streams.
- o Weight the pipeline sufficiently so that exposure due to buoyancy is minimized.

Effectiveness: These measures would greatly reduce the impacts associated with pipeline construction across streams. However, in streams with moderate to high sensitivities due to channel gradients these measures would not be sufficient to reduce impacts to nonsignificant levels.

General Impact: Impacts associated with the withdrawal and discharge of water used in hydrostatic testing of the pipeline.

53. Additional Mitigation: Water used in hydrostatic testing of the pipeline shall be discharged ~~into appropriately designed retention ponds prior to discharge into the environment~~ in accordance with local, state, and federal (NPDES) permits. ~~Retention ponds shall be filled in and returned to preconstruction conditions after use.~~ If retention ponds are stipulated, the applicant will consult with the land managing agency or landowner to determine the disposition of the pond after construction.

Effectiveness: The use of retention ponds where necessary should serve to dissipate high energy flows (as high as 5 cfs) during discharge further minimizing potential significant impact caused by scouring.

54. Additional Mitigation: No stream with an inadequate flow rate shall be used as a water source for hydrostatic testing, and adequate flow should be maintained for instream uses and downstream withdrawals. Consultation

with the appropriate agency will be required to determine adequate stream flows.

Effectiveness: This measure should minimize significant impact due to substantial dewatering of a stream.

55. Additional Mitigation: Reuse water for hydrostatic testing where possible.

Effectiveness: This measure should also greatly minimize the demand for water from streams.

General Impact: Reduction in water quality due to fuel or chemical spillage, and impacts to surface water resources during the operation and abandonment of the pipeline.

56. Additional Mitigation: Chemicals, fuel, and lubricating oils shall not be stored near stream channels. Spill containments shall be installed or constructed around all chemical, fuel, and oil storage areas. Refueling and lubricating oil changing shall not be done in or near stream channels, or where an accidental spill could run into a stream channel or shallow ground water zone. Any accidental spills shall be promptly cleaned up.

Effectiveness: The proposed measures would effectively minimize the potential for significant water quality degradation due to fuel or chemical spillage.

General Impact: Not all increased surface runoff, erosion, and off-site sedimentation would be reduced to acceptable, non-significant levels. Additional mitigation beyond the proposed shall be required to further reduce these impacts.

See Mitigation Measure 26.

57. Additional Mitigation: Intensive surface runoff and erosion control shall be required beyond those proposed on steep slopes that would drain directly into streams. The applicant shall ~~make judicious~~ use ~~of~~ sediment filters, closely spaced water bars, and erosion netting.

Effectiveness: Measures such as sediment filters, closely spaced water bars, and erosion netting are required to further reduce these impacts to non-significant levels. The reclamation potential of some soils on steep slopes may be so poor that stabilization of the disturbed area may take five to ten years to occur. Consequently, even if the most prudent site stabilization techniques were implemented, a residual and potentially significant level of impact could continue.

General Impact: Removal of vegetative cover or desert pavement resulting in increased erosion.

See Mitigation Measure 26.

58. Additional Mitigation: Minimize width of the ROW to that absolutely necessary.

Effectiveness: The potential increase in surface water runoff, erosion, and off-site sedimentation from the ROW would be reduced since the area of disturbance would be reduced.

Summary of Effectiveness of Staff Recommended Mitigation Measures: The available mitigation measures would further control impacts to surface water.

4.10.1.5 Groundwater

Applicant Proposed Measures

General Impact: Potential channeling of ground water along pipeline.

59. Mitigation: Bulkheads or ditch plugs would be installed in the trench on slopes to minimize potential channeling along the pipeline by groundwater that seeps into the backfilled trench. [Mojave/Staff]

Effectiveness: This measure would minimize potential for channeling.

Staff Recommended Measures

General Impact: Effects on springs.

60. Additional Mitigation: Identify all nearby springs which serve as sources of water supply or are important to wildlife. Evaluate potential effects of construction and take appropriate precautions to ~~minimize any adverse effects~~ avoid impacts such as increased access to and use of springs by humans that could result in decreased use by wildlife.

Effectiveness: Possibility of significant impact to important springs would be minimized.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Possibility of significant impact to important springs or shallow aquifers would be minimized.

4.10.1.6 Freshwater Biology

Applicant Proposed Measures

General Impact: Increased sedimentation and turbidity of aquatic habitats.

61. Implementation of applicant proposed sediment control procedures outlined in Section 4.10.1.4. [Mojave/ Transwestern]

The El Dorado Interstate Transmission Company has identified three areas of general impact with respect to mitigation and results. Pipeline construction activities within streams and rivers would be limited to the extent practical to avoid impacts to the aquatic ecosystem. All activities within watercourses would occur only during specific times allowed by the regulatory agencies. Timing the construction activities in accordance with regulatory requirements would reduce the potential impacts to the hydrology of the streams and rivers crossed by the pipeline. [El Dorado]

62. Mitigation: Construction of suspended stream pipeline crossing and minimize stream bank and channel activity by working away from the immediate stream course and restore bank stability. [El Dorado]

Effectiveness: Reduced or eliminated bank cutting and erosion and in stream construction.

Summary of Effectiveness of Planned Mitigation Measures: Construction of suspended stream crossings often appears as the least impacting to an aquatic resource when done away from the stream bank. These mitigation measures should reduce impacts to a non-significant level.

Staff Recommended Measures

General Impact: Increased turbidity and sedimentation of aquatic habitats.

63. Additional Mitigation: Work backhoes or draglines from the stream banks where possible, to trench any submerged stream crossings.

Effectiveness: Reduced instream disturbance by eliminating the presence of heavy tracked machinery in the stream bed.

64. Additional Mitigation: During construction on federal lands near streams or lakes, sedimentation basins and/or straw bale filters shall be constructed, as required by the FS/BLM.

Effectiveness: Sediments traveling downstream will be reduced.

General Impact: Disturbance of stream banks would result in bank cutting and erosion.

65. Additional Mitigation: Disturbed stream banks shall be restored by replacing topsoil and replanting native riparian species. Where appropriate and feasible, stream crossings will be fenced to ensure reclamation of riparian habitat. Fencing will be done on a site-specific basis in consultation with the appropriate state and federal land management authorities.

Effectiveness: Restoration of disturbed stream banks should improve stability and reduce or eliminate cutting and bank erosion, especially during period of high stream flow.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Implementation of the staff recommended mitigation measures would further reduce impacts.

4.10.1.7 Terrestrial Biology

4.10.1.7.1 Vegetation

Applicant Proposed Measures

General Impact: Loss of vegetation

66. Mitigation: The applicant would design and implement site-specific revegetation plans according to the requirements and guidelines of the land management agency (BLM, USFWS, or FS), state agency, or landowner. These plans are assumed to include the necessary topsoil replacement, seedbed preparation, mulching, fertilization, use of seed mixtures containing native species, noxious weed control and additional erosion control. Generally the revegetation objective would be to return the disturbed area to a condition that would perpetuate previous land use. Guidelines established by the SCS would be used where the pipeline would traverse private land, and if it is agreeable to the owner. Periodic inspection of the ROW would be conducted by the applicant and reclamation efforts enhanced where needed. [Mojave/El Dorado/Transwestern]

Effectiveness: The successful implementation of a site-specific revegetation plan would greatly reduce the magnitude and duration of impacts to general vegetation for those community types which have a reasonable revegetation potential. Of particular concern would be the success of revegetation within sensitive communities such as known habitat for wildlife species of special concern, agricultural lands, wetlands and riparian zones, and Joshua tree woodland types as well as in types with poor revegetation potential such as those that occur in the Mojave Desert. Significant impacts to the community types with poor reclamation potential may continue even with the implementation of prudent site-specific plans.

67. Mitigation: During construction in sensitive areas the applicant would clear the minimum ROW width possible and minimize ROW damage where possible (e.g., not stripping vegetation less than four inches in height, leaving trees standing and/or mowing taller vegetation as opposed to clearing, the last being particularly desirable in Mojavean shrub communities). ~~It is assumed that this would~~ This shall include local adjustment of pipeline alignment to avoid areas with high densities of sensitive plant species or sensitive communities in order to minimize ROW damage. [Mojave/El Dorado/Transwestern/Staff]

Effectiveness: Minimizing ROW width would decrease the acreage of vegetation denuded by construction and lessen the overall cumulative impacts to vegetation types that occur along the proposed route. Additionally, minimizing ROW damage by leaving vegetation standing or mowing where possible would greatly enhance natural revegetation of the ROW.

General Impact: Loss of sensitive plant species individuals or habitat.

68. Mitigation: The applicant shall avoid, where feasible and necessary, locations of sensitive species and environmentally sensitive areas which include sensitive communities and known and suspected habitat of plant species of special concern. Specific information on sensitive areas would be obtained by conducting field surveys along portions of the proposed route for individuals and habitat of species of concern and sensitive communities. Field surveys would be conducted during the appropriate time of year by a qualified botanist. Where feasible, pipeline alignment would be adjusted to miss or minimize impacts to identified individuals or habitats. [Mojave/El Dorado/Transwestern/Staff]

Effectiveness: Realignment of the proposed line to avoid populations or habitats of plant species of special concern as well as sensitive communities would be the most effective method of reducing impacts associated with loss of the sensitive plant species and communities.

69. Mitigation: The applicant plans informal consultation with the U.S. Fish and Wildlife Service to obtain a determination of which federally listed, proposed or candidate threatened or endangered species could occur along the pipeline ROW. [El Paso]

Effectiveness: Consultation with the USFWS would aid in identifying areas where impacts to threatened and endangered species are likely to occur.

70. Mitigation: The applicant plans to notify the Arizona Commission of Agriculture and Horticulture at least 30 days prior to the start of construction, so that the agency can survey the proposed ROW segments within the State of Arizona and salvage protected plants. [El Paso]

Effectiveness: Notification of the Arizona Commission of Agriculture and Horticulture and subsequent surveys would allow for an assessment of impacts associated with construction of the proposed loop expansions and possibly reduce impacts to species protected in Arizona that could be salvaged from the ROW.

Summary of Effectiveness of Planned Mitigation Measures: Mitigation proposed by the applicant to reduce or minimize impacts (Class II) associated with the denudation of vegetation are incomplete. Additional mitigation pertaining to revegetation of the ROW and minimizing impacts to sensitive species and communities is needed and discussed below.

Staff Recommended Measures

General Impact: Loss of vegetation.

71. Additional Mitigation: For areas supporting sensitive communities or species of special concern, restrict access onto pipeline ROW, where possible, by constructing barricades, fences with locked gates or by posting with signs.

Effectiveness: Successfully limiting access onto the pipeline ROW would enhance natural revegetation of reclaimed areas in addition to minimizing further destruction of undisturbed vegetation adjacent to the ROW.

72. Additional Mitigation: Existing ground cover such as grasses, leaves, brush, and tree trimmings shall be cleared and piled only to the extent necessary. Slash and limbs shall be piled and later shredded and chipped for use in restoration operations or disposed of as directed by the appropriate agency or landowner.

Effectiveness: Measure will enhance restoration operations.

73. Additional Mitigation: Trees and shrubs ~~on the ROW~~ that are not cleared shall be protected from damage during construction.

Effectiveness: Measure will protect trees and shrubs from unneeded damage.

74. Additional Mitigation: Trench backfilling operations shall be conducted in such a manner to minimize further disturbance of vegetation.

Effectiveness: Measure will minimize disturbance to vegetation.

75. Joint inspection of the ROW by the company(s) and the FS/BLM shall be conducted on federal lands to monitor the success and maintenance of erosion control measures and revegetation programs on native grazing lands for two growing seasons, or for a period determined by the FS/BLM. The monitoring program would identify problem areas and corrective measures to ensure vegetation cover and erosion control. Certification of successful revegetation and erosion control would be determined by the FS/BLM.

76. On federal lands, seed shall be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method, because it is usually most successful.

- o Drill seeding with a grass drill equipped with depth bands shall be used where topography and soil conditions allow operations of equipment to meet the seeding requirements of the species being planted.
- o Broadcast seeding shall be used for inaccessible or small areas. Seed shall be covered by raking or harrowing.
- o Hydroseeding would be done in critical areas determined by the FS/BLM.

77. Only species adapted to local soil and climatic conditions shall be used on federal lands. Generally, these would be native species. However, introduced species may be considered for specific conditions when approved by the FS/BLM. ~~Seeding rates in critical area plantings and generally throughout the ROW would be increased 100 percent over regular seeding rates to allow for seed mortality due to adverse growing conditions~~ Specific seeding rates shall be developed on an area-specific basis in consultation with reclamation specialists and jurisdictional agencies.

78. ~~Seed-testing~~ Testing of seed to be used on federal land will be conducted on federal lands to meet state, federal, and agency seed requirements.

79. On federal lands, seeding shall be done when seasonal or weather conditions are most favorable and as determined by the FS/BLM.

80. Grazing on federal lands shall be delayed for a period directed by the FS/BLM to provide for vegetation to become established, especially in highly erodible areas. Procedures for excluding grazing within the ROW should be subject to site-specific analysis and/or negotiation with the landowner/land management agency and could involve protective fencing; removal of range animals from affected allotments, with compensation by the company(s) to range permittees; adjustable grazing use schedules within allotments; etc. In the case of protective fencing, fences shall be constructed, maintained and removed by the company(s) according to FS/BLM specifications.

81. On federal land, the applicant shall preclear ~~mountain brush--and--tree--covered--areas~~ those areas containing merchantable timber prior to dozer or maintenance blade work. Preclearing would involve handwork or specialized equipment, i.e., mechanized shears, etc., in cutting of brush or trees with removal by proper equipment to designated areas. The applicant shall windrow all scalped and remaining large woody vegetation along the edge of the ROW.

Effectiveness: Measures will enhance reseeding ROW and promote revegetation.

General Impact: Loss of sensitive plant species individuals or habitat.

82. Additional Mitigation: Removal of certain sensitive plant species from the ROW may be a way to decrease impacts to certain plant species in California. If plants are removed, replanting shall occur in suitable habitat outside the zone of potential disturbance (construction and ORV use). Such sites shall be established in consultation with the appropriate land management agencies.

Effectiveness: If all sensitive plant species can be removed prior to construction and be successfully re-established, no significant impacts would occur. The practicality of the measure would be dependent on the abundance of plants and their ability to withstand transplanting.

83. Additional Mitigation: Wetland and riparian vegetation impacted by construction or operation be replaced in kind.

Effectiveness: Wetland and riparian vegetation will be replaced.

General Impact: The loss of plant species of special concern or species contained in sensitive communities due to pipeline construction when it is not feasible to avoid such areas containing these species.

84. Additional Mitigation: The applicant shall conduct surveys as directed by the appropriate governmental agencies to identify precise locations of species of special concern or species contained in sensitive communities. The applicant shall utilize survey results to avoid or alleviate impacts that would likely result in the loss of these species.

Effectiveness: Surveys will result in identifying precise locations of species of special concern which in turn can be avoided by pipeline route realignment.

85. Additional Mitigation: When it is not feasible to avoid areas containing plant species of special concern, the applicant shall attempt to transplant perennial plant species back into the ROW after construction.

Summary of Effectiveness of Staff Recommended Mitigation Measures: The available mitigation measures would further control impacts to vegetation. Even the most prudent mitigation measures would not remove all significant impacts particularly to sensitive community types such as oak woodland and creosote bush scrub community.

4.10.1.7.2 Wildlife

Applicant Proposed Measures

General Impact: Disturbance to high interest species, such as game animals and raptors during periods of high stress, such as migration, breeding and/or rearing.

86. Mitigation: The applicant plans to have a competent wildlife biologist survey all potential raptor nesting and game animal habitats within 0.5 mile of the pipeline prior to construction. No construction would occur within 0.5 mile of active nests in the nesting period (March 15 to July 15). If bald eagle nests occur, the stayout period would be December 15 to June 15. The appropriate state or federal agency has guidelines defining calendar dates when activity should not occur for other raptors. [Mojave/Staff]

Effectiveness: The proposed mitigation would alleviate significant impacts relating to disturbance of raptors during nesting.

87. Mitigation: The applicant plans to avoid physical disturbance of any raptor nests.

Effectiveness: Avoidance of physical disturbance of raptor nests would not mitigate losses due to nest abandonment due to disturbance of nesting birds from noise, presence of man, and other indirect or non-physical disturbances associated with pipeline construction. [Transwestern]

General Impact: Disturbance or loss of habitat necessary to sustain high-interest species. This includes but is not limited to habitat utilized as courtship, nesting/rearing, and wintering areas.

88. Mitigation: The applicant plans to revegetate with native and introduced species as appropriate for long-term habitat recovery. [Transwestern]

Effectiveness: In the case of big game, this would result in the re-establishment of woody species necessary for browse and cover on winter ranges and fawning areas for mule deer and antelope.

General Impact: Disturbance to any species of special concern, including federal and/or state listed or candidate species and BLM sensitive species.

89. Mitigation: The applicant plans to survey all potential desert tortoise habitat along the pipeline route and include the results of the survey in the project planning process to minimize construction-related impacts to the species. Construction procedures planned by the applicant to date include restricting construction to between October and March when the tortoise are hibernating. A competent tortoise biologist would survey the proposed route immediately in advance of construction equipment and remove active and/or hibernating tortoise and move them to another burrow or hibernaculum outside the construction ROW. Injured or dead tortoise would be handled and/or disposed of according to the Memorandum of Understanding with the California Department of Fish and Game or other appropriate agencies and funds provided by the applicant for rehabilitation and return of the tortoise to their home range. [Mojave]

Effectiveness: This mitigation is consistent with ~~mitigation~~ measures ~~presented in a detailed methodology~~ developed for the All American Pipeline Project ~~to minimize~~

~~loss of desert tortoise~~ [Reyes-French, 1985] ~~and would address concerns regarding this impact~~ and subsequently reviewed for effectiveness and modified in 1986. However, not all of the appropriate measures proposed by Reyes-French have been included by the applicant. Additional measures are needed to protect individuals and habitat. It should be noted that the construction window for the desert tortoise would be in conflict with that required for the Mohave ground squirrel.

90. Mitigation: The applicant plans to limit the length of open trench in desert bighorn sheep areas, skip sections of trench, or provide temporary bridges where more than 0.5 mile of trench would remain open for extended periods of time. [Mojave]

    Effectiveness: This mitigation measure would help reduce disturbance of the animals and loss or injury of animals from falling in open trenches.

91. Mitigation: Surveys would be conducted by the applicant to determine the distribution of San Joaquin kit fox and blunt-nosed leopard lizard habitat in areas of the San Joaquin Valley that would be traversed by the proposed pipeline. Rerouting of the pipeline would be evaluated and done where possible and in areas where the habitat of the two species must be crossed, the width of the construction ROW would be restricted to 50 feet. Pipeline alignment would be adjusted to avoid dens within the construction ROW. No construction would be done in San Joaquin kit fox suitable habitat during pupping season (March-May) and revegetation plans would include measures to promote re-establishment of plant species that annually produce seeds, in order to favor populations of kangaroo rats, which are the kit fox staple food. [Mojave/Staff]

    Effectiveness: Avoidance of habitat is the best possible mitigation relating to reducing impacts to species of special concern and where not possible mitigation presented by the applicant would help to minimize losses of San Joaquin kit fox as a result of construction activity.

92. Mitigation: Once pre-construction clearance surveys have been completed, consultation with USFWS/CDFG and the appropriate land management agencies would be continued in order to share results. El Dorado will propose measures to minimize impacts to T&E species located on or immediately adjacent to the staked ROW. Agreements would be made regarding conservation measures required for each species and then implemented by El Dorado. Notices-to-proceed and various permits would be obtained on the basis of these agreements. As appropriate, final design and routing and executed construction contracts would incorporate the agreed-to conservation measures and stipulations. Environ-

mental briefings would be prepared and given to all project personnel highlighting environmental requirements on the project, sensitive natural resources, and habitats. El Dorado would also monitor construction activities to ensure compliance with relevant environmental stipulations, laws, and permit requirements.

Where pre-construction surveys or the EIR/EIS confirm the presence of T&E or sensitive species along the proposed ROW, El Dorado would implement the following conservation measures as approved by the Authorized Officer and USFWS/CDFG:

- San Joaquin kit fox natal dens located within the proposed construction zone would be avoided by at least 100 feet;
- construction would be limited within a 1/2-mile radius of any active peregrine falcon aerie;
- where occupied blunt-nosed leopard lizard or Tehachapi slender salamander habitat is located within the proposed ROW, efforts to avoid such habitat would be made where feasible; when not feasible, the construction zone would be limited to 50-foot width in these areas; these measures would also be implemented where Mohave ground squirrels, Nelson's antelope squirrels, or giant kangaroo rats are found;
- bald eagle communal winter roosts located within 1/2-mile of the proposed Colorado or Kern River crossings would not be disturbed;
- during construction the open pipeline trench would be limited in desert bighorn sheep areas or areas where the pipeline could limit wildlife access to water. Skip sections or temporary bridges across the pipeline trench would also be used if more than 1/2-mile of trench must remain open for an extended period;
- pipeline construction across desert tortoise habitat would occur between October and March when tortoises are hibernating. A desert tortoise expert would be present during construction. Any active desert tortoises would be removed from the construction ROW ahead of construction equipment and moved to another burrow or hibernaculum outside the construction ROW. Burrows within the ROW would be carefully opened using hand tools and hibernating tortoises moved to an artificial burrow. Injured or dead tortoises would be handled and/or disposed of according to the Memorandum of Understanding with the California Department of Fish and Game or other appropriate agencies. Costs of rehabilitating injured tortoises and returning them to

their home sites would be paid by the applicant. [El Dorado]

Effectiveness: Avoidance of habitat is the best possible mitigation relating to reducing impacts to species of special concern and where not possible mitigation presented by the applicant would help to minimize losses of San Joaquin kit fox as a result of construction activity.

93. Mitigation: The applicant plans to conduct surveys as required by the USFWS for species of special concern and their associated habitat. [Transwestern]

Effectiveness: Surveys for species of special concern would aid in developing appropriate mitigation measures prior to construction.

94. Mitigation: The applicant plans to minimize disturbance of special status animals and their habitat. [Transwestern]

Effectiveness: Minimizing disturbance to special status animals would be achieved by scheduling construction activities to avoid conflict with species of special concern during crucial time periods such as migration for bighorn sheep and nesting in the case of ferruginous or Swainson's hawks and southern spotted owl. The appropriate state or federal agency has guidelines defining calendar dates when activity should not occur for these species.

Minimizing disturbance of habitat implies an effort on the applicant's part to restrict the construction ROW to the minimum width possible in areas designated as habitat for species of special concern. This would help limit the amount of habitat loss, but would not alleviate all impacts associated with pipeline construction.

95. Mitigation: The applicant plans to restrict construction across desert tortoise habitat to a time period between October and March, when tortoise are hibernating. [Transwestern]

Effectiveness: This mitigation is consistent with ~~mitigation~~ measures ~~presented--in--a--detailed--methodology~~ developed for the All American Pipeline Project ~~to-minimize loss--of--desert--tortoise~~ [Reyes-French, 1985] ~~and--would address--concerns--regarding--this--impact~~ and subsequently reviewed for effectiveness and modified in 1986. However, not all of the appropriate measures proposed by Reyes-French have been included by the applicant. Additional measures are needed to protect individuals and habitat. It should be noted that the construction window for the desert tortoise would be in conflict with that required for the Mohave ground squirrel.

Summary of Effectiveness of Planned Mitigation Measures: Mitigation presented above would help reduce impacts to high-interest species and species of special concern, but additional conservation measures would be needed to further reduce impacts to desert bighorn sheep, blunt-nosed leopard lizard and other species of special concern not addressed by the applicant.

Staff Recommended Measures

General Impact: Disturbance to high interest species such as game animals and raptors during periods of high stress such as migration, breeding and/or rearing.

96. Additional Mitigation: Limited speed of vehicles along the ROW and access roads to 15 mph in sensitive habitats that support species of special concern with limited home ranges and mobility, e.g., the blunt-nosed leopard lizard and the desert tortoise. Construction and maintenance employees shall also be advised that care should be exercised when commuting to and from the project area to reduce road mortality.

    Effectiveness: Speed limits during the construction and periodic inspection and maintenance phases would minimize the change of animal/vehicle collisions.

97. Additional Mitigation: The applicant shall prohibit vehicle operation off the ROW by construction workers, including construction work and employees access, except where specified by the landowner or land management agency or where roads already exist.

    Effectiveness: Impacts will be limited to within the ROW.

98. Additional Mitigation: Project related powerlines shall be designed to protect birds from electrocution and collision.

    Effectiveness: Mortality to high interest species will be reduced.

99. Additional Mitigation: Public access into habitat used by high interest species shall be controlled by restricting access onto pipeline ROWs where possible by constructing barricades, fences with locked gates, or by posting with signs. This will be required for all wildlife management areas identified and/or established by both state and federal wildlife agencies.

    Effectiveness: Eliminating access into habitat used by high-interest species during periods of high stress would eliminate extra stress associated with use of ORVs on the pipeline ROW.

General Impact: Disturbance or loss of habitat necessary to sustain high interest wildlife species. This includes but is not limited to habitat utilized as courtship areas, nesting/rearing areas, and special habitat features such as water guzzlers, water tanks and springs.

100. Additional Mitigation: Revegetate all disturbed wildlife habitat deemed important to high interest species to pre-disturbance levels following guidelines formulated by the appropriate governmental agency.

Effectiveness: Revegetation, particularly in-kind, would minimize habitat disturbances. A short-term impact would remain for the time it takes for revegetation efforts to come to fruition. Replacement of old growth forests is not likely.

101. Additional Mitigation: In sensitive or important wildlife habitats, clear the minimum ROW width possible and minimize ROW damage.

Effectiveness: Minimizing the ROW width would reduce the amount of sensitive habitat lost. This would be particularly important in old growth forests that cannot be effectively replaced to a predisturbance condition. Minimizing ROW damage to native vegetation would enhance natural revegetation of the ROW.

General Impact: Loss of individuals of any species of special concern (federal and/or state listed or candidate species, BLM sensitive species). Disturbance that results in a reduction in recruitment to their populations.

102. The following 12 conservation measures were recommended by the U.S. Fish and Wildlife Service in their biological opinion on these projects. The 12 conservation measures apply only to those projects traversing the San Joaquin Valley in California. As part of the formal consultation process between USFWS and FERC, the staff adopts these measures.

a) The pipeline alignment through the southern San Joaquin Valley shall be modified to reduce impacts to extant wildland habitats utilized by the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat. Modification shall include maximizing pipeline siting and associated access routes, staging/laydown sites, structures, and other related facilities on currently intensively developed agricultural lands or other highly modified areas. The applicant(s) shall provide a supplemental biological assessment based on route re-alignment and field surveys to the U.S. Fish and Wildlife Service and Federal Energy Regulatory

Commission for review and comment prior to construction. The subject report should clearly state the following: (a) alignment of the modified pipeline route; (b) survey methodologies and results, with detailed estimates of numbers of animals and sign observed and acreage of extant habitats of each species that will still be unavoidably impacts; (c) mitigation measures mandated for species/habitat protection; and (d) measures mandated for offsetting unmitigable on-site effects to these species. The specific route realignment and associated mitigation must be acceptable to the U.S. Fish and Wildlife Service and the Federal Energy Regulatory Commission staff. Concurrence form the U.S. Fish and Wildlife Service shall precede any construction within the geographic range of the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat.

b) The pipeline alignment shall avoid, to the extent practical, habitats of the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat.

c) Construction activities must be confined to a maximum 100-foot-wide corridor within habitat of the San Joaquin kit fox, blunt-nosed leopard lizard, or giant kangaroo rat. Where corridors in excess of this 100-foot-width may be disturbed, the applicant shall obtain concurrent from the U.S. Fish and Wildlife Service prior to initiation of construction.

Prior to construction, the applicant shall submit the following information to the U.S. Fish and Wildlife Service for review and comment:

o proposed locations of all access roads, staging/laydown areas, pumping stations, valve stations, and other ancillary facilities that are planned within extant habitats of the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat;

o results of preliminary surveys of these sites for the occurrence of listed species and their sign;

o estimates of acreage of listed species habitats that will be adversely affected by proposed project actions; and

o measures proposed to limit habitat disturbance and harm to listed species.

d) Construction shall take place in a manner that employs the following actions to reduce incidental take to listed species:

- A biologist familiar with the habits of these species and their sign shall be present on-site during construction.

- Construction shall utilize the minimum numbers and types of vehicles and equipment necessary on portions of the proposed alignment within listed species habitat.

- Stockpiling of equipment and parking of vehicles shall be undertaken to the maximum extent possible on previously disturbed areas proximate to the construction zone.

- Locations of San Joaquin kit fox dens and giant kangaroo rat burrow systems shall be prominently staked and flagged to decrease inadvertent destruction.

e) Maintenance activities within the project pipeline right-of-way that require the cross-country driving of vehicles or equipment or the removal of vegetation shall be limited to those actions required to effect repairs or for "emergency" situations where environmental or public health is placed at risk. Regular crushing or mowing of vegetation within the pipeline corridor crossing habitats utilized by the San Joaquin kit fox, blunt-nosed leopard lizard, or giant kangaroo rat is not authorized. Regular vehicle access along the proposed pipeline corridor within listed species habitats shall be limited to existing roads or to newly constructed access roads approved with the prior review and concurrence of the U.S. Fish and Wildlife Service.

f) Preconstruction surveys shall be required for all project-related construction activities that have the potential to result in the incidental taking of San Joaquin kit foxes and blunt-nosed leopard lizards. Planned locations of associated roads, staging/laydown sites, valve stations, pumping stations, and other related facilities within potentially occupiable habitats of one or more of these species must also be surveyed. Such surveys must be conducted within 60 days from the planned start of construction. Locations of kit fox dens and giant kangaroo rat burrow systems shall be prominently marked and mapped during these surveys. Proposed project construction activities shall be modified to the extent possible to avoid destruction of all kit fox dens and giant kangaroo rat burrows identified. The proposed pipeline construction corridor must be adjusted to maintain a minimum 50-foot construction-free "buffer" from any San Joaquin kit fox dens or giant kangaroo rat burrows. Flagging and stakes identifying the locations of these sites shall be removed within 60 days of termination of construction activities.

g) In the event that a San Joaquin kit fox den or giant kangaroo rat burrow will be unavoidably destroyed by a planned project action, the following procedures shall be followed:

- o Prior to construction, the entrance(s) of the kit fox den or giant kangaroo rat burrow system shall be partially blocked with loose dirt for several days to discourage use while allowing any animals in residence to escape.

- o The partially blocked kit fox den or giant kangaroo rat burrow system shall then be excavated using hand tools either by a wildlife biologist or under the direct supervision of a wildlife biologist to ensure that no animals are trapped or injured. Animals discovered will be allowed to escape.

- o Excavated San Joaquin kit fox dens and giant kangaroo rat burrows shall be completely destroyed to prevent later use prior to on-set of construction.

- o Documentation of the San Joaquin kit fox den or giant kangaroo rat burrow loss shall be conveyed in writing to the U.S. Fish and Wildlife Service within 5 days of the date of den or burrow destruction.

- o If the subject den is a natal or pupping den, the applicant, prior to destruction of this den site, shall contact the U.S. Fish and Wildlife Service.

- o Where San Joaquin kit fox dens are destroyed from project-related actions, the applicants shall construct an equal number of artificial dens to partially offset lost predator-avoidance habitat. Selection of artificial den sites location and design shall be made by field biologists hired by the applicant in discussion with the U.S. Fish and Wildlife Service and California Department of Fish and Game staff.

h) The applicant shall develop and implement a worker education program that addresses:

- o the occurrence and distribution of the San Joaquin kit fox, blunt-nosed leopard lizard and giant kangaroo rat within the project area;

- o measures being implemented to protect these species during project construction and subsequent maintenance activities; and

- o methods that individual employees can undertake to facilitate this process.

i) Any application of rodenticides within the geographic range of the San Joaquin kit fox and giant kangaroo rat for subsequent facility or road embankment maintenance to control California ground squirrels (Sphermophilus beecheyi) shall be limited to spot-treatment with zinc phosphide. NO rodenticides may be applied within a one-quarter-mile radius of known giant kangaroo rat burrow systems.

j) In the event of a pipeline rupture, the following measures shall be used to reduce incidental taking of the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat:

- o The California Department of Fish and Game and U.S. Fish and Wildlife Service shall be immediately notified of any pipeline rupture, its specific location and extent, and measures underway for cleanup and pipeline repair.

- o Cleanup and restoration of the area affected by the pipeline rupture shall include:

  - immediate containment, using constructed earthen berms or other means to contain the damage to the smallest possible area;

  - utilizing biologists familiar with these species to locate and flag San Joaquin kit fox dens, giant kangaroo rat burrows or other especially sensitive areas for avoidance by cleanup equipment, and to inventory the impacted area for entrapped or injured wildlife, effecting rescue where possible;

  - removal of contaminants and contaminated soils for safe off-site disposal in an expeditious fashion; and

  - recontouring and restoring the affected area, including utilizing vegetation restoration techniques, until equal to pre-impact condition.

k) If the established limit of incidental take of any federally-listed species is exceeded, the causative action shall cease and consultation shall be reinitiated within 5 working days of the most recent mortality.

l) The U.S. Fish and Wildlife Service is to be notified within 3 working days of the finding of any endangered species found dead during this project. Any San Joaquin kit foxes, blunt-nosed leopard lizards, or giant kangaroo rats found dead or injured shall be turned in to the California Department of Fish and Game.

Effectiveness: The FWS determined that implementation of these measures will protect the San Joaquin kit fox, blunt-nosed leopard lizard, and giant kangaroo rat so they will not be in jeopardy.

103. Additional Mitigation: The applicant shall conduct detailed surveys prior to construction as directed by the appropriate governmental agencies in order to identify precise locations of viable populations of species of special concern. Surveys shall be conducted at the appropriate season and time to ensure that targeted species can be enumerated. The applicant shall utilize survey results to avoid or alleviate impacts that would likely result in the loss of individuals of species of special concern.

Effectiveness: Surveys for species of special concern would aid in developing appropriate mitigation measures prior to construction.

104. Additional Mitigation: Surveys of the proposed pipeline ROW shall be conducted in areas providing habitat for federally proposed or listed species.

Effectiveness: By identifying species habitat possible conservation measures could be implemented to reduce impacts to these species.

105. Additional Mitigation: Impacts to high interest species could be sufficiently mitigated through scheduling construction activities so that they do not conflict with resident wildlife during times of high stress. The appropriate state of federal management agency has guidelines defining calendar dates when activity should not occur for the species in question. Scheduling for construction may vary with the environment and climatological circumstances for any given year.

Effectiveness: Timing of construction activities as not to conflict with periods of migration would reduce stress on individual animals by allowing free movement between ranges.

106. Additional Mitigation: Construction activities for threatened or endangered species shall be timed so as not to conflict with crucial time periods such as hibernation. This would apply to the blunt-nosed leopard lizard but not to the desert tortoise where construction during hibernation is desired.

Effectiveness: Timing of construction activities to not conflict with crucial time periods would reduce chances of causing impact.

107. Additional Mitigation: Trenches shall be inspected daily for species of special concern that might have fallen into the trenches. Any species of special concern found should be handled in accordance with prearranged agreement with the appropriate agency.

Effectiveness: Trench inspection on a daily basis would reduce impact to species which have fallen into the trench.

108. Additional Mitigation: In San Joaquin kit fox habitat, establish temporary artificial barriers 35-50 feet from washes to minimize potential chemical contamination from surface runoff.

Effectiveness: These temporary artificial barriers around washes would help to protect critical wildlife habitat and would reduce impacts to all species.

109. Additional Mitigation: ~~Limit the length and duration of open trenches. Open trenches shall be limited in length to 0.25 mile and duration of open segments shall not exceed three days. Before backfilling, the trench shall be inspected for trapped animals. All such animals shall then be released in the same general locality, but beyond the area of disturbance.~~ The length and duration of open trenches shall be kept to the minimum extent feasible. Limiting the length and duration of open trenches in areas of sensitive species shall be developed on a site-specific/species-specific basis. The amount of open ditch and duration of open ditch in areas of sensitive species shall be governed by cooperation of applicants and appropriate land management/wildlife agencies. Before backfilling, the trench shall be inspected for trapped animals. All such animals shall then be released in the same general locality, but beyond the area of disturbance.

Effectiveness: Limiting the length and duration of open trenches will reduce impacts to species.

110. Additional Mitigation: ~~In areas potentially occupied by desert tortoise, the following mitigation methodology developed by Reyes French (1985) shall be adopted. Conduct a preconstruction survey to delineate areas of desert tortoise concentrations. Limit construction activities in these areas to the hibernation period between October 15th and March 1st in the western Mojave Desert and October 1st and April 1st in the eastern Mojave Desert. Employ qualified biologists to conduct tortoise searches within the impacted area immediately before construction so that hibernating individuals may be removed from the path of~~

~~construction. Have a desert tortoise expert on-site during the construction phase. Remove any active tortoises ahead of the construction equipment. Hibernating tortoises removed from the construction area shall be kept over the winter at an appropriate facility under specified artificial environmental conditions. These individuals shall be released the following spring in the immediate vicinity of their capture. The appropriate authorities shall be notified of any injury to tortoises so that these individuals may be transferred to qualified veterinarians for care.~~ In areas potentially occupied by desert tortoise, the following mitigation methodology modified from Reyes-French [1985] shall be adopted. Conduct preconstruction surveys to delineate areas of construction activities. Within potential desert tortoise habitat, construction procedures shall be restricted to tortoise hibernation periods. This construction window would be 1 October to 1 April in the eastern Mojave Desert of California, Nevada, and Utah; 15 October to 1 March in the western Mojave Desert of California; and 30 October to 1 March in Arizona. A competent tortoise biologist will survey the route and other areas of potential disturbance immediately in advance of construction and remote active and/or hibernating tortoises to a site outside the ROW. A competent biologist will return the tortoises removed from construction areas to their capture points after surface disturbances have been completed. A competent tortoise biologist will be on-site during any flushing or hydrostatic testing to prevent loss or injury to individuals. Injured or dead tortoises will be handled and/or disposed according to Memorandum of Understanding with state fish and game agencies and the U.S. Fish and Wildlife Service. Any Arizona tortoises found injured or dead shall be surrendered to the Arizona Game and Fish Department. Barriers and signs will be placed along the ROW to inhibit development and use of the ROW as an off-road vehicle road or trail. All construction vehicles and equipment will be restricted to the ROW to limit tortoise habitat degradation. Construction personnel will be informed of the sensitive nature of this species and the prohibitions against vandalism and removal of individuals.

Effectiveness: ~~If the Reyes-French mitigation plan were to be followed, tortoise losses would likely be minimal. This measure, however, with regard to the construction window would be in conflict with requirements for protection of the Mojave ground squirrel.~~ This mitigation is consistent with measures developed for the All American Pipeline Project [Reyes-French, 1985] and subsequently reviewed for effectiveness and modified in 1986. Limiting equipment and vehicles to the ROW and education of construction personnel are additional measures appropriate to alleviation of tortoise impacts. By adhering to these mitigation measures and other measures for species of special concern, the applicant would minimize loss of individuals and habitat degradation.

111. Additional Mitigation: Limit speed of vehicles along the ROW and access roads to 15 mph in sensitive habitats that support species of special concern with limited home ranges and mobility, e.g., the blunt-nosed leopard lizard and the desert tortoise. Construction and maintenance employees shall also be advised that care should be exercised when commuting to and from the project area to reduce road mortality.

Effectiveness: Speed limits during the construction and periodic inspection and maintenance phases would minimize the chance of animal/vehicle collisions.

112. Additional Mitigation: Access to the ROW shall be restricted wherever feasible by construction barricades, fences with locked gates at road intersections, and by posting signs. State wildlife agencies, as well as federal agencies, shall be consulted to help identify and establish wildlife management areas and vehicle access (except for administrative purposes) to these areas shall be restricted. On federal land, as directed by the Forest Service/BLM, temporary and/or permanent structures shall be installed at specific locations along the ROW and other disturbed sites to prevent off-road vehicle access.

Effectiveness: Limiting access to the ROW would minimize long-term disturbance to species of special concern.

General Impact: Loss or disturbance of habitat utilized by species of special concern. This includes any designated critical habitat of proposed or listed threatened or endangered species, or loss or disturbance of greater than one percent of habitat supporting a viable population of species of special concern.

See mitigation measures to protect species of special concern.

113. Additional Mitigation: The applicant shall conduct field surveys as directed by the appropriate governmental agencies to identify ~~environmentally-sensitive areas, such as nest sites, winter roosts, or~~ habitat that supports viable populations of species of special concern. The applicant should avoid these areas where possible.

Effectiveness: By identifying sensitive habitats and habitat components, the applicant could then avoid such sites and minimize potential impacts. Avoidance of specific habitat components, such as bald eagle winter roost sites, is necessary to ensure the quality of habitat.

These habitat components are generally traditional in nature, and limited in quantity and spatial distribution.

114. Additional Mitigation: Public access into habitat of species of special concern shall be controlled by restricting access onto pipeline ROWs where possible by constructing barricades, fences with locked gates, or by posting with signs. This will be required for all wildlife management areas identified and/or established by both state and federal wildlife agencies.

Effectiveness: Eliminating access to critical habitat of species of special concern would reduce stress on animals and destruction of habitat associated with use of ORVs on the pipeline ROW.

115. Additional Mitigation: Revegetate all disturbed critical habitat and habitat suitable for species of special concern to predisturbance levels following guidelines formulated ~~by~~ in consultation with the appropriate governmental agencies.

Effectiveness: In-kind revegetation would minimize most habitat disturbances, although in many cases the reclamation potential is limited, and complete habitat restoration may take many years or be impossible to accomplish.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Scheduling construction activities as not to conflict with desert bighorn sheep migration and not providing new public access into crucial habitat for sheep and other species of special concern would reduce, and in some cases eliminate, impacts associated with the construction of the proposed pipeline.

Surveys to assess potential impacts to species of special concern and to plan construction activities and conservation measures to reduce impacts would serve to minimize the overall impacts associated with construction.

4.10.1.7.3 Grazing

Applicant Proposed Measures

General Impact: Loss of 5 percent or more of carrying capacity on an allotment traversed by the proposed pipeline alignment.

116. Mitigation: Clear only the minimum ROW width and take steps to minimize ROW damage. [Mojave/Transwestern]

Effectiveness: Minimizes loss of AUMs and helps maintain carrying capacity.

117. Mitigation: Revegetate the ROW so that pre-project grazing opportunity levels are re-established. [Mojave/Transwestern]

Effectiveness: Minimizes the period when AUMs are lost.

General Impact: Broken fences and disruption of natural and artificial barriers to livestock needed to maintain separation and control of livestock.

118. Mitigation: Maintain livestock separation and control during construction, repair fences and maintain livestock separation and control devices such as cattleguards, gates, drift fences, and natural barriers to equal the effectiveness of the existing control structures prior to pipeline construction or operation. [Mojave/Transwestern]

Effectiveness: Restores livestock control facilities to pre-project level.

119. Additional Mitigation: If none of the mitigation measures are effective, feasible or available and revegetation of the ROW is of major importance to the managing agency, the ROW shall be fenced for at least three to five years. In some cases, a 50 foot crossover strip placed every two miles would be feasible.

Effectiveness: By eliminating grazing pressure and associated activity along the adversely affected portion of the ROW within a given allotment, revegetation efforts would succeed and the adverse impact eliminated. Use of cross-over strips would allow use of both sides of an allotment separated by the ROW and thereby reduce loss of carrying capacity.

120. Additional Mitigation: The applicant shall replace any water lines or drinkers damaged as a result of pipeline construction.

Effectiveness: Damaged water lines or drinker will be repaired.

Summary of Effectiveness of Planned Mitigation Measures: Mitigation measures for grazing should effectively mitigate long-term impacts to grazing. No additional mitigation measures would be required.

Staff Recommended Measures

See Mitigation Measure 31.

No additional measures are recommended.

4.10.1.8 Socioeconomics

Applicant Proposed Measures

General Impact: Pipeline construction workers may impact housing and tourism.

121. Mitigation: Construction of the pipeline would be scheduled to avoid peak tourist seasons in the affected area if possible. ~~Other construction stipulations may affect timing to avoid peak tourist seasons.~~ Communities which experience population increases from tourism and resultant demands for housing and services are Needles and Lake Havasu City in the vicinity of the Mojave Transfer Line and Mojave Mainline. The populations of these communities reach a peak between November and May when winter residents are in the area. Barstow experiences increased demands for housing and services during summer months due to tourists and travelers along the major interstate routes. [Mojave]

Effectiveness: Implementation of this measure would minimize the pressure on housing supplies in these tourist areas.

122. Mitigation: In rural areas along the Mojave Pipeline route, workers ~~would need~~ should consider to seek housing and services in larger, more distant communities. Project employees may be able to travel to and from construction areas together. [Mojave/Staff]

Effectiveness: Implementation of this measure would concentrate project-related housing demands in developed areas where accommodations are available, thus alleviating pressures on small communities and reducing the individual commuting time.

123. Mitigation: To further mitigate housing impacts in rural areas or in crowded tourist areas, workers ~~may be able~~ should try to reside in temporary trailer camps. Work camps would mitigate pressures in Needles, Barstow, Boron, Mojave, and Tehachapi, as well as in smaller towns in San Bernardino County. [Mojave/Staff]

Effectiveness: Implementation of this measure would also permit small communities with limited services to benefit from employee expenditures for food and supplies while residing in their own temporary accommodations.

Summary of Effectiveness of Planned Mitigation Measures: Implementation of the mitigation measures outlined by the applicant should effectively reduce socioeconomic impacts.

Staff Recommended Measures

General Impact: Construction of the project(s) may result in unsafe conditions for the construction workforce and the public.

124. Additional Mitigation: The applicant shall comply with all applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities and operations. The applicant would obtain approval from the applicable agency prior to the use of such substances. The plan would provide the type and quantity of the material to be used; the pest, insect, fungus, etc., to be controlled; the methods of application; the location of storage and disposal of containers; and other information that the agency may require. The plan would be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1, 1986, deadline for a fiscal year 1988 action). If the need for emergency use of pesticides is identified, the use must be approved. The use of substances on or near the ROW and temporary permit areas shall be in accordance with the approved plan. A pesticide would not be used if the Secretaries of the Interior and Agriculture have prohibited its use. A pesticide would be used only in accordance with its registered uses and with the Secretarial limitations. Pesticides shall not be permanently stored on federal lands.

    Effectiveness: Pesticide use would be controlled.

125. Additional Mitigation: All structures such as terraces, levees, underground drainage systems, irrigation pipelines, and canals shall be restored to preconstruction conditions so that they would function as originally intended.

    Effectiveness: All such structures would be restored to preconstruction conditions.

126. Additional Mitigation: Gates on established roads on National Forest System lands shall not be locked or closed by the applicant.

    Effectiveness: National Forest System policies would be met.

127. Additional Mitigation: Permittees and other regular users of National Forests affected by construction of the project(s) shall be notified in advance of any construction activity that might affect their businesses or operations. This would include but not be limited to temporary road closures, removal and/or cutting of fences, disturbances to range improvements or other range use-related structures.

Effectiveness: National Forest System policies would be met.

128. Additional Mitigation: Garbage, toxic substances and other refuse shall be disposed of in an authorized disposal site of landfill.

Effectiveness: Refuse will be properly disposed.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Implementation of the mitigation measures outlined by the staff should effectively reduce socioeconomic impacts.

4.10.1.9 Land Ownership/Use

General Impact: All the pipeline companies must comply with or conform to all administrative agencies, plans, policies, and regulations and negotiate with private land owners and easement holders if a land use conflict is identified. Mohave County, Arizona, would need to amend its land use plan to allow pipelines to go through commercial zones. The company would need to negotiate with the private mine owners. The California Desert Conservation Area's Resource Management Plan would need to be amended to designate a new utility corridor. Negotiations with Edwards Air Force Base would be necessary to traverse their land. Mojave would need to consult with the Stallion Springs landowners and the planned development would need to be amended for future development. Negotiations with El Tejon Ranch owners and managers before traversing their land would be required. Owners of orchards and vineyards would need to be consulted and compensated before construction. Impacts to the two Kern County parks would be short-term and would require coordination between park management and the applicant.

Applicant Proposed Measures

No planned mitigation measures were provided by the applicants.

Staff Recommended Measures

General Impact: Conflict with land use.

129. Additional Mitigation: Technical assistance and approval of written plans for National Forest System lands shall be obtained form the Forest Service prior to any construction.

Effectiveness: Early coordination with National Forests will ensure that forest land use plans are complied with.

130. Additional Mitigation: All existing improvements under federal management or permit shall be protected and damage repaired immediately.

Effectiveness: Impacts to existing land use will be minimized.

131. Additional Mitigation: Forest Service approval shall be required for locating sites for equipment storage, pipe storage, and staging areas on National Forest System lands. A site preparation plan would be required for these sites as part of the COM plan.

Effectiveness: Measures will ensure conformance with Forest Service land use plans.

132. Additional Mitigation: A fire control plan shall be prepared as part of the COM plan for the Forest Service.

Effectiveness: Measures will ensure conformance with Forest Service land use plans.

4.10.1.10 Cultural Resources

4.10.1.10.1 Archaeology

Applicant Proposed Measures

General Impact: Disturbance to cultural resources could occur along the proposed route.

133. Mitigation: A cultural resource management plan would be designed and implemented by the applicant in consultation with the California and Arizona State Historic Preservation Officers and the authorizing agencies. The management plan would outline procedures and methods to identify, evaluate, and protect (i.e., through avoidance or scientific data recovery) significant cultural resources.

It is expected that a cultural resource "emergency discovery" program would be a stipulation of all relevant permits. Such a stipulation would conform with the Archeological and Historic Preservation Act as amended and would state that, should cultural resources be found during ground-disturbing activities, construction would be halted until the resource can be evaluated and recovered if judged significant. [Mojave]

134. Mitigation: Field inventories would determine the presence of cultural resources within the ROW. Newly discovered sites would be tested for potential significance and eligibility for the National Register. Where eligible and

unavoidable, sites would be excavated and treated in accordance with data recovery plans approved by the appropriate agencies.

Should any cultural resources be identified during earthwork activities, the California State Historic Preservation Office of the State Department of Parks and Recreation would be notified for comment and, if necessary, inspection. Likewise, should any resources be identified in the pipeline ROW within the State of Arizona, the Arizona State Parks Board of the State Historic Preservation Office would be notified. [El Dorado]

135. Mitigation: The applicant would initiate consultation with the Arizona and New Mexico SHPOs to verify that the project complies with the National Historic Preservation Act of 1966. [El Paso]

136. Mitigation: A cultural resource management plan would be designed and implemented by the applicant in consultation with the Texas, New Mexico and Arizona State Historic Preservation Officers and the authorizing agencies. The management plan would outline procedures and methods to identify, evaluate, and protect (i.e., through avoidance or scientific data recovery) significant cultural resources. Impacts to resources that are not prudently or feasibly avoidable would be mitigated according to the procedures and methods of the cultural resource management plan. The cultural resource management plan is outlined below.

Prior to project construction, the applicant would design and conduct an intensive cultural resource survey equivalent to a BLM Class III pedestrian survey of any previously uninventoried lands crossed by the final pipeline route and ancillary facilities. This survey would be done in consultation with appropriate Native American groups to help identify resources of traditional Native American value.

Once properly identified and recorded, criteria for evaluation of the resources in terms of National Register eligibility would be applied. Additional information concerning the resources would be obtained if required to apply those criteria.

Cultural resources that have been determined eligible for inclusion in the National Register would be evaluated as to the impact of the potential project. Indicators for determining the potential effect of construction on cultural resources are set forth in 36 CFR 800.9. If it is determined that significant adverse effects upon National Register-eligible properties may occur as a result of the proposed project, then mitigation measures to reduce or eliminate these adverse effects would be implemented.

Mitigation of adverse effects to significant cultural resources can be accomplished through avoidance, preservation in situ, or scientific data recovery and report preparation by a qualified professional anthropologist, archeologist, or architectural historian. Avoidance is always the preferred mitigation option when feasible. This can be accomplished through redesign of project components. Scientific data recovery and report preparation is usually the third option for mitigating adverse effects to cultural resources. This can be accomplished through archaeological excavation, further archival research, and in the case of standing structures, documentation according to Historic American Building Survey (HABS) standards. A report must be prepared documenting the method, theory, and results of the work suitable for submission to the Texas, New Mexico and Arizona State Historic Preservation Officers and the lead agency.

Consideration would be given to a monitoring program for ground-disturbing activities in areas where cultural resource inventory indicates a likelihood that resources not now evident on the ground surface are likely to occur as buried resources.

It is expected that a cultural resource "emergency discovery" program would be a stipulation of all relevant permits. Such a stipulation would conform with the Archeological and Historic Preservation Act as amended and would state that, should cultural resources be found during ground-disturbing activities, construction would be halted until the resource can be evaluated and recovered if judged significant. [Transwestern]

Summary of Effectiveness of Planned Mitigation Measures: Mitigation measures developed for cultural resources should effectively mitigate impacts to both cultural resources and Native American concerns.

Staff Recommended Measures

General Impact: Disturbance to cultural resources could occur along the proposed route.

The FERC and SLC prepared a Cultural Resource Technical Report for the various projects (including alternative routes) pursuant to 36 CFR Part 800.4(a) of the new regulations of the Advisory Council on Historic Preservation (ACHP). A draft version of the Technical Report was circulated in September 1986 to the various SHPOs, ACHP, BLM, Forest Service, Bureau of Indian Affairs, and the Navajo Nation. Comments were received and incorporated into a revised Technical Report which was recirculated for appropriate agencies' use as part of the compliance process for

Section 106 of the National Historic Preservation Act. As stated in the Introduction to Volume I of this EIR/EIS, this Technical Report is not distributed to the public. The salient information, however, is summarized in the EIR/EIS. The Technical Report, while not required in order to comment on the EIR/EIS, will assist the SHPOs in the compliance process as recommended below.

137. Additional Mitigation: Based on the Cultural Resource Technical Report, the regulations at 36 CFR Parts 61.2, and the new ACHP regulations at 800.4 (a) (ii) and 800.4 (b) published in the Federal Register on September 2, 1986 (51 FR 31115), the applicant(s) receiving FERC certification shall contact the appropriate SHPO(s) for assistance in evaluating additional information resources which should be consulted and their recommendations for further surveys to enable the certificated applicant(s) to ~~assess~~ form their opinion as to the eligibility of those properties currently identified in the Technical Report and identify any additional eligible or National Register properties. The certificated applicant(s) shall consult these resources and furnish the results of the assessment along with the SHPO's recommendations for field surveys to the FERC staff.

The FERC, the SHPO(s), and other appropriate agencies will consult to determine the adequacy of all previous field surveys which cover portions of the certificated pipeline route and sites of appurtenant facilities, and may require further surveys on inadequately inventoried lands.

A cultural resource management plan shall then be designed by the applicant in consultation with the FERC, the SHPO(s), and other appropriate agencies including, on federal lands, BLM, the Forest Service, Bureau of Indian Affairs, and the Fish and Wildlife Service, as necessary. The management plan shall outline procedures and methods to identify, evaluate, and protect (i.e., through avoidance or scientific data recovery) National Register and eligible properties. Appropriate research questions will be included in the plan, although others may develop as the field investigation studies proceed. Guidelines for mitigation of impacts to resources that are not avoidable shall be included in the cultural resource management plan.

Consideration shall be given to a monitoring program for ground-disturbing activities in areas where cultural resource inventory indicates a likelihood that resources not now evident on the ground surface are likely to occur as buried resources. Such an "emergency discovery" program would be consistent with the ACHP regulations at 36 CFR Parts 800.5 and 800.11 (a).

Prior to project construction, but after the formulation of the management plan, the applicant shall design and conduct an intensive cultural resource survey, of the final pipeline route and ancillary facilities, where necessary, that is equivalent to a BLM Class III pedestrian survey. ~~of any previously uninventoried lands crossed by the final.~~ This survey shall be done in consultation with appropriate Native American groups to help identify resources of traditional Native American value.

Upon completion of the field surveys, the applicant shall identify for the FERC and appropriate SHPO(s) all cultural properties potentially affected by the undertaking, and how each property addresses either the research questions in the management plan, or other National Register criteria of eligibility, and the applicant's opinion of the effect of the project on any properties. Once properties are properly identified and recorded, the FERC staff, in consultation with the SHPO(s), will identify National Register properties by applying the National Register criteria of eligibility in light of the research questions developed for the management plan, new research questions inherent in the data, or other criteria under 36 CFR 60.4. Additional information concerning the resources would be obtained by the applicant if required by the FERC staff to apply those criteria.

Cultural resources determined eligible for inclusion in the National Register by the FERC or other authorizing agency would then be evaluated as to the impacts of the project. A determination of effect would be made by the FERC staff in consultation with the appropriate SHPO(s) pursuant to 36 CFR Part 800.5. Indicators for determining the potential effect of construction on cultural resources are set forth in the ACHP regulations at 36 CFR Part 800.9.

If it is determined that effects upon National Register or eligible properties would occur as a result of the project, a mitigation plan to reduce or eliminate these effects would then be formulated. Site-specific mitigation plans would be formulated in accordance with the appropriate provisions of the management plan. An modification of the management plan deemed necessary in light of discoveries made during the field surveys would also be identified. The mitigation plans shall discuss the timetables for completion of the final report for the phases of mitigation associated with data recovery, laboratory analyses and artifact curation. The final report shall document the method, theory, and results of implementing the mitigation plans. The final report shall be submitted to the FERC and the appropriate SHPO(s) upon completion in accordance with the identified timetables.

If properties on or eligible for the National Register would be affected, the FERC shall afford the ACHP an opportunity to comment on the effects of the project and the proposed mitigation plans.

Until the FERC staff has informed the applicant(s) in writing that the ACHP has provided the FERC with its comments pursuant to Section 106 of the National Historic Preservation Act and the applicant(s) has agreed to any modifications of the mitigation plan which the ACHP and the FERC staff have agreed upon, the applicant(s) may not proceed with implementation of the mitigation plans or with construction.

4.10.1.10.2 American Indian Concerns

The Fort Mojave Tribal Council has expressed strong objections to the placing of a new pipeline on reservation lands.

138. Additional Mitigation: Tribal plans for cultural resource preservation shall be followed on tribal lands. In general, sacred and archaeological sites shall be avoided whenever possible, burials shall be left undisturbed, and care taken to avoid the destruction of traditionally used plants and animals. Artifacts recovered from archaeological excavation shall be returned to the tribe if found on tribal lands.

Summary of Effectiveness of Staff Recommended Measures: These additional mitigation measures should adequately mitigate the adverse effects to cultural resources and Native American concerns.

4.10.1.11 Paleontological Resources

Applicant Proposed Measures

General Impact: Loss or disturbance of paleontological resources could occur along the pipeline route.

139. Mitigation: The following describes measures designed to avoid or mitigate potentially adverse effects to paleontological resources resulting from construction of the proposed project. [Mojave/El Dorado/Transwestern/Staff]

Pre-Construction. After consultation with the appropriate resource management agencies, those areas identified as being of high paleontological sensitivity would be examined prior to construction to determine the precise nature and location of fossils previously discovered within one mile of the pipeline route. Attention would be directed toward identifying sections of these corridors where construction would result in bedrock disturbance adjacent to localities known to yield significant fossils. An initial pre-construction evaluation would be made by comprehensively reviewing pertinent published paleontological literature, museum fossil locality records, and by requesting additional locality data from paleontologists who are engaged in active research in these areas.

After consultation with the appropriate resource management agency, a pre-construction surficial field inventory may then be recommended for those parts of the 100-foot wide pipeline construction ~~corridor~~ right-of way where disturbance of fossils may occur. The purpose of this inventory would be to evaluate in more detail the significance of local fossils by identifying the fossil types present, ascertaining their quality of preservation, and determining more precisely their extent and distribution. At some localities, small shallow trenches may be excavated to facilitate these observations.

If it is found that significant fossils could be adversely affected, appropriate site-specific mitigation measures would be designed. These measures may include the controlled scientific removal of fossils that would otherwise be damaged or destroyed during construction. Any such removals would be made by professional paleontologists authorized by the appropriate federal, state, and county collecting permits. In accordance with these permits, all fossils would be placed in appropriate repositories, with records of their precise locality, and descriptions of the geological and faunal context of each. This survey would also determine whether additional mitigation measures should be implemented during construction activities.

Construction. Mitigation measures that may be implemented during construction include monitoring construction activities in which bedrock would be disturbed. This may entail inspection of cleared and graded sections of the corridor before trenching, and inspection of the rock excavated from the trench before burial of the pipe.

Procedures would be established and approved by permitting agencies for temporarily halting or redirecting construction if fossil accumulations are encountered during construction. An approved paleontologist, contracted to implement the management plan, would be notified immediately upon encountering a chance fossil find so that the significance of the find can be evaluated efficiently and, if necessary, mitigation actions taken.

If significant fossils are encountered during construction, their controlled scientific removal from the construction site may be necessary. Removal of fossils discovered during construction would be implemented by professional paleontologists in accordance with professionally recognized standards.

Summary of Effectiveness of Planned Mitigation Measures: The proposed mitigation measures should effectively mitigate impacts to paleontological resources.

Staff Recommended Measures

No additional measures are recommended.

4.10.1.12 Visual Resources

Applicant Proposed Measures

General Impact: Degradation to visual resource quality could occur along the pipeline route.

140. Mitigation: The applicant proposes to implement three generic types of mitigation techniques: 1) strategic location, 2) minimization of disturbance, and 3) repetition of basic landscape elements (form, line, color, texture). Mitigation recommendations described below, based on these techniques, would reduce visual contrasts of the project facilities.

Construction: During construction, clearing of land for facilities or structures would create curvilinear boundaries instead of straight lines and minimize marring and scarring of the landscape to the greatest practical extent. Grading would be done in a manner which would minimize erosion and conform to the natural topography [USFS, 1977].

Cleared brush or small trees not otherwise disposed of would be piled in a way that provides cover habitat for small mammals, reptiles, and birds. Such brush piles would be screened from public view to the greatest practical extent [Robinette, 1973].

Soil and rocks that are excavated but not used during construction and not used would be evenly spread into the cleared area or removed from the site. Soil and rocks would be graded to conform with the terrain and the adjacent land. [Mojave/Transwestern]

Compressor Station MJ-1: The colors selected for the compressor station, and other structures and facilities would be based on the following considerations [Robinette 1973]:

- The colors would be uniform and noncontrasting to blend with the immediate natural environment. The warmest color tones are appropriate for natural settings.

- Exposed concrete would be tinted to match the soil color.

- Colors would be selected on the basis of their ability to blend with both the sky and the environment in which they are being used.

- Colors that reflect adjacent colors by including them are most successful in adapting to their environment and would be utilized.

- Colors approved in the Munsell Soil Color Coding System and displayed on the Standard Environmental Color Chart would be used.

- The applicant prepare a plan to minimize visual impacts from structures. If required, the applicant would prepare photographic simulations of areas in which facilities are proposed within foreground-middleground areas of high scenic value or sensitivity. Using the simulation as a guide, the applicant would design and locate the pipeline route and ancillary structures to blend into the existing environment. On federal lands, the BLM/FS would evaluate and approve measures before construction begins. [Mojave/Staff]

Overhead Electrical Powerline to Compressor Stations:

- Towers or poles shall be placed strategically to make maximum use of existing topography and vegetation for screening.

- Electrical power lines shall be located at the base of slopes when feasible to provide a background of topography and/or natural cover.

- Materials used to construct towers or poles shall harmonize with the natural surroundings. Where natural wood poles are appropriate, the color range would be limited to present unified series of poles.

- Choice of conductor material shall be carefully considered to avoid sheen or a strong silhouette and to provide blending of the conductors into any given setting through which the line must pass.

- When lines are adjacent to roads, guyed towers shall be avoided whenever possible. [Mojave]

Summary of Effectiveness of Planned Mitigation Measures: The planned mitigation measures outlined by the applicant should reduce visual contrast along many portions of the proposed route.

Staff Recommended Measures

Mitigation are identified in three broad categories: landscape-type mitigation, distance zone mitigation, and performance mitigation. In general the mitigation of vegetation and soils impacts are the only reasonable mitigation for visual impacts as well. Special cases may include high impact areas where specific concern from citizens and/or land management agencies have indicated detailed visual analysis and mitigation measures be developed. These should be developed on a case-by-case basis.

General Impact: Degradation of visual resource quality could occur along the pipeline route.

141. Additional Mitigation: Landscape-type Measures

Grading and earthwork

o Minimize routing pipeline along prominent ridgelines.

Forested Areas. The digger pine-oak ecosystem is encountered in the Tehachapi Mountains along the mainline route. Mitigation measures shall include:

o Leave trees as close to the downhill side of the ROW as possible,

o Create as few landings and turnouts as possible, and do not locate them on the noses of ridges or exposed slopes,

o Avoid grade changes as much as possible,

Distance Zone Measures:

Foreground View. A foreground view is determined to be the detailed view from between 0 to 1/4-1/2 mile from the viewer. Visual impact appearing in a foreground view shall be to obscured, concealed, or disguised through screening or controlling access to views.

Middleground and Background View. Views beyond 1/2 mile shall be mitigated by revegetation techniques to blend the impact back into the surrounding environment, utilizing landscape texture, color, and pattern to subordinate the impact and soften the edges.

Performance Measures:

In order to meet BLM's Visual Resource Management (VRM) Objectives, certain time limitations shall be established within which mitigation measures must occur to reduce visual impacts upon the existing environment.

Additional Mitigation: On federal lands the applicant shall prepare a plan to minimize the visual impacts from structures. If required by the FS/BLM, the applicant would prepare photographic simulations of the areas in which facilities are proposed within foreground-middleground areas of high scenic value or sensitivity. Using the simulation as a guide, the applicant would design and locate the pipeline route and ancillary structures to blend into the existing environment. The FS/BLM would evaluate and approve measures before construction begins.

142. Additional Mitigation: For the COM plan, the FS/BLM would identify segments of the pipeline ROW on federal lands where vegetative clearing widths would be modified, i.e., feathered or undulated. This would be done to maintain the visual quality objectives of the respective National Forest Land and Resource Management Plan.

Summary of Effectiveness of Staff Recommended Mitigation Measures: Utilization of the mitigation measures outlined above should result in no significant adverse impacts following application of the appropriate mitigation measures.

4.10.1.13 System Safety and Reliability

Applicant Proposed Measures

Safety aspects of pipeline design and operation are governed by federal regulations as summarized in Section 4.2.13.3. ~~The Mojave Pipeline Company has~~ All the applicants reiterated in ~~its~~ their applications that the ~~company~~ companies would conform to all the requirements of these regulations.

Staff Recommended Measures

See Mitigation Measures recommended in Section 4.10.1.2 and specific recommendations for each company.

4.10.2 Staff Recommended Mitigation Measures for the Mojave Proposal

Geology

143. The volcanic cinder cones near Amboy and Hector shall be investigated to estimate the potential of an event that would affect the Mojave Mainline and allow for contingency planning.

Terrestrial Biology

Vegetation:

144. Mojave shall notify the Arizona Commission of Agriculture and Horticulture at least 30 days prior to the start of construction so that the agency can survey the proposed ROW in Arizona and salvage protected plants.

Land Use

145. Mojave shall realign its route to maximize use of existing corridors in the CDCA. The applicant shall use Alternative B as modified by the El Dorado route around Barstow. The route shall also be realigned to avoid Edwards Air Force Base by using Kern River's mainline route in this area.

146. Mojave shall realign its route between the town of Mojave and the floor of the San Joaquin Valley to avoid Tehachapi Mountain Park, the community of Stallion Springs, and the Chanac Creek drainage. This can be accomplished by using either the proposed Kern River or El Dorado routes in this area.

147. Mojave shall cross the Kern River at the location identified for the North Bakersfield Variation to Kern River's proposed project to avoid major impact to Kern River County Park.

System Safety and Reliability

148. Aircraft monitoring of the pipeline ROW for operation and maintenance purposes shall be coordinated with nearby military installations, e.g., Edwards AFB, in order to avoid potential conflict.

149. The residential areas of Indian John Spring and Stallion Springs shall be avoided by rerouting the pipeline corridor. These areas are particularly sensitive since potential active fault are crossed in this area.

150. The route through Bakersfield shall be carefully selected to avoid or minimize impact on areas zoned residential or recreational.

4.10.3 Staff Recommended Mitigation Measures for the El Dorado Alternative

Geology

151. The volcanic cinder cones near Amboy and Hector shall be investigated to estimate the potential of an event that would affect both the El Dorado Mainline and Alternative A and allow for contingency planning.

Terrestrial Biology

Vegetation:

152. El Dorado shall notify the Arizona Commission of Agriculture and Horticulture at least 30 days prior to the start of construction, so that the agency can survey the proposed ROW in Arizona and salvage protected plants.

Land Use

153. El Dorado shall realign its route to avoid Edwards AFB by using Kern River's proposed route in the area.

System Safety and Reliability

154. Aircraft monitoring of the pipeline ROW for operation and maintenance purposes shall be coordinated with nearby military installations, e.g., Edwards AFB, in order to avoid potential conflict.

155. The route through Bakersfield shall be carefully selected to avoid or minimize impact on areas zoned residential or recreational.

4.10.4 Staff Recommended Mitigation Measures for the El Paso Proposal

Geology

156. The volcanic cinder cones present, if one of the alternative cases is certificated, northwest of Flagstaff, Arizona shall be investigated to estimate the potential of an event that could affect the El Paso Expansion and allow for contingency planning.

Land Use

157. The El Paso 100/500 or 200/400 alternatives would cross the Elden Environmental Study Area along the 4.1 miles of the Leupp Loop west of the Flagstaff Compressor Station. This area shall be avoided by eliminating that section of the loop by appropriate engineering design, either by relocation or increased compression.

Cultural Resources

American Indian Concerns:

158. The Navajo Nation has well-developed policies with regard to archaeological and sacred sites and the disposition of burials. They require a complete inventory of archaeological and sacred sites along the proposed expansion loops. Such an inventory will require both a pedestrian survey of the construction corridor and facility areas as well as interviews with local residents (land-users) and medicine men to fully document the presence of sacred sites. Some of these sites are already on record in local BIA offices. Burials, if encountered, must be identified if possible, and avoided whenever feasible. Reburial is possible when certain conditions are met, however. Archaeological excavation requires a permit from the Navajo Nation. In addition, the various chapters of the Navajo Nation wish to have a voice regarding which side of the original pipeline the proposed expansion loops would be laid. El Paso shall follow the requirements of the Navajo Nation.

4.10.5 Staff Recommended Mitigation Measures for the Northwest Expansion Project

Geology

159. No surface disturbance will be allowed within 100 feet of perennial streams within the Grand Junction Resource Area.

Terrestrial Biology

Vegetation:

160. For the protection of the federally listed species Uinta Basin hookless cactus, and spineless hedgehog cactus, the following actions should be undertaken:

- Prior to construction, the right-of way, staging areas, and new access roads will be staked and surveyed for the subject species by conducting field surveys by qualified botanists during the appropriate time of year.

- o Individual plants, populations, and habitat identified adjacent to the staked right-of-way, staging areas, and access roads, will be flagged and signed to alert construction workers to avoid these sensitive areas.

- o Pipeline right-of-way alignment, staging areas, and access roads will be adjusted to avoid individual plants or habitat of the subject species.

- o Public off-road vehicle use of the right-of-way, staging areas, and access roads, will be prevented in the vicinity of the known occurrences of these plant taxa and suitable habitat by the use of signs, gates, or fences.

- o Vehicles and equipment will not be permitted outside of the right-of-way, staging areas, and access roads during construction or pipeline operation.

Wildlife:

161. If looping is required on Northwest's system, Northwest shall conduct surveys as required by the USFWS to identify prairie dog colonies in the project area. Where active colonies are found to be impacted by the proposed route, further surveys by a qualified biologist shall be completed to determine the presence or absence of black-footed ferrets. Such surveys shall be done within one year of initial pipeline construction.

162. Black-footed ferret surveys shall be conducted if any rodent control operations are undertaken for prairie dogs in potential ferret habitat. If the most recent survey work for ferrets is less than 1-year old, then no additional work is required.

4.10.6 Staff Recommended Mitigation Measures for the Transwestern Proposal

Geology

163. The volcanic cinder cones present northwest of Flagstaff, Arizona shall be investigated to estimate the potential of an event that could affect the Transwestern Expansion and allow for contingency planning.

Soil

164. Transwestern shall implement erosion control measures in the Carlsbad Resource Area (BLM Roswell District) as required by the authorizing officer. One example of such

as measure is the use of water bars with the following guidelines:

- Simulate the imaginary contour lines of the slope, ideally with a grade of 1 to 2 percent.
- Drain down and away from the disturbed area.
- Begin and end in vegetation.
- Use the following spacing intervals:

Slope (%)	Interval (ft)
less than 2.5	200
2.5 to 5	150
6 to 9	100
more than 9	50

Terrestrial Biology

Vegetation:

165. Transwestern shall notify the Arizona Commission of Agriculture and Horticulture at least 30 days prior to construction, so that the agency can survey the proposed ROW in Arizona and salvage protected plants.

166. Throughout the Carlsbad Resource Area reseeding will be required on all portions of the ROW where blading occurs. Seeding will be done with a disk-type drill. The seeder will be followed by a drag, packer, or rollers to ensure adequate compaction. The seed mixture will consist of:

Species	Pounds per acre of pure live seed
Sand dropseed	0.25
Sand lovegrass (*Eragrostis trichoides*)	0.50
Little bluestem (*Andropogon scoparius*)	0.25

Wildlife:

167. Prior to construction on public lands in the Carlsbad Resource Area, a qualified biologist shall survey all potential raptor habitat within 0.25 mile of the pipeline and identify active and inactive nests. Construction within 0.25 mile of active aeries shall not be permitted

during the nesting season (April 1 to ~~October~~ September 1 for raptors). ~~Construction is permitted near inactive nests; n~~ Nests shall not be disturbed at any time. ~~Construction may occur between October 2 and March 28.~~

168. Additional Mitigation: Construction activities in the vicinity of established or suspected migration corridors for desert bighorn sheep shall be timed so as not to conflict with animals during migration. The appropriate state or federal management agency shall be contacted to establish calendar dates which would define the time of construction that would minimize impacts due to disturbance.

Effectiveness: Timing of construction activities as not to conflict with periods of migration would reduce stress on individual animals by allowing free movement between ranges.

169. Additional Mitigation: Use of heavy equipment or explosives should be restricted in Sections 11 and 12, Township 19 North, Range 20 West, and Section 7, Township 19 North, Range 19 West in Arizona between December 1 and June 30. This should be done to protect bighorn sheep lambing activities.

Effectiveness: Elimination of heavy equipment or explosives used in these areas during the times prescribed should reduce adverse impacts to bighorn sheep lambing.

Land Use

170. Transwestern Loop G would be on the border of the Fort Valley Experimental Forest in Coconino NF. The loop shall be located on the north side of the existing pipeline in the vicinity of the experimental forest.

171. Transwestern shall inform the Waste Isolation Pilot Project authorities of its pipeline crossing under the north access road and water pipeline.

172. Loop I will be placed on the south side of the existing line in order to avoid infringement on the Mount Nutt Wilderness Study Area.

Cultural Resources

American Indian Concerns:

173. The Navajo Nation has well-developed policies with regard to archaeological and sacred sites and the disposition of burials. They require a complete inventory of archaeolo-

gical and sacred sites along the proposed expansion loops. Such an inventory will require both a pedestrian survey of the construction corridor and facility areas as well as interviews with local residents (land-users) and medicine men to fully document the presence of sacred sites. Some of these sites are already on record in local BIA offices. Burials, if encountered, must be identified if possible, and avoided whenever feasible. Reburial is possible when certain conditions are met, however. Archaeological excavation requires a permit from the Navajo nation. In addition, the various chapters of the Navajo Nation wish to have a voice regarding which side of the original pipeline the proposed expansion loops would be laid. Transwestern shall follow the requirements of the Navajo Nation.

4.10.7 Federal Land Management Agency Recommended Mitigation Measures

The following land management agencies have provided recommended mitigation measures which would apply to land under their jurisdiction and which, in some cases, they believe should be applied universally: Bureau of Land Management, Forest Service, U.S. Fish and Wildlife Service, and the U.S. Air Force - Edwards Air Force Base.

These mitigation measures are reproduced in this section.

The staff has reviewed these measures and recommended certain of them be incorporated into the FERC certificate. Those measures adopted by staff have been incorporated into staff recommended measures in Volumes I, II, and III. Those which apply only to the federal agency's land are listed separately in the following table. Some of the other measures were already covered in the staff measures previously recommended, and are identified as such in Table 4.10-1. Finally, there ~~are~~ were other measures identified by these agencies which the staff ~~is~~ was not prepared to recommend at the time of the DEIS and requested ~~and would like~~ input from the public. The reviewer ~~is~~ was specifically requested to comment on the need, appropriateness, and feasibility of these latter measures and whether they should be incorporated into the FERC certificate. Very few commentors responded positively and even less provided background support for these latter measures. Therefore, the majority of these latter measures are not being adopted by the FERC staff for incorporation into the FERC certificate. The measures not being adopted are identified in Table 4.10-1.

Table 4.10-1

OTHER FEDERAL AGENCY MITIGATION MEASURES

	Recommended for Adoption			
	All Lands	Federal Land Only	Covered	Not Recommended for Adoption
Bureau of Land Management	5, 6, 11		1, 2, 13, 14, 15, 16, 20, 23, 25, 26, 27, 31, 33, 35-37	3, 4, 7, 8, 9, 10, 12, 17, 18, 19, 21, 22, 24, 28, 29, 30, 32, 34, 38
USDA Forest Service	8, 9, 21, 26, 29, 31, 32, 59, 62, 69, 71	1, 3, 12, 13, 14, 27, 38-42, 44 1/, 45, 55, 60, 61, 63, 64, 66-68,	2, 4-7, 10, 11, 15-20, 22-25, 28, 33-37, 43, 46, 47, 49, 50, 51, 53, 54, 56-58, 65, 70, 72	28, 30, 44 1/, 48, 52
USDOI Fish and Wildlife Service (Mojave Transfer Line and Mainline, El Dorado North Receipt Lateral and Mainline)	13, 14, 17		1, 3-12, 15, 16, 18	2, 19
US Air Force - Edwards Air Force Base (Mojave Mainline, El Dorado Mainline)	-	-	1, 2, 3	4, 5, 6

1/ Forest Service Mitigation Measure 44 partly covered in Staff Mitigation Measure 88 in Vol. III.

4.10.7.1 BLM Recommended Mitigation Measures [1]

1. Mitigation: Throughout the ~~Carlsbad Resource Area~~ Roswell District reseeding will be required on all portions of the ROW where blading occurs. Seeding will be done with a disk-type drill. The seeder will be followed by a drag, packer, or rollers to ensure adequate compaction. The seed mixture will consist of:

Species	Pounds per acre of pure live seed
Sand dropseed	0.25
Sand lovegrass (*Eragrostis trichoides*)	0.50
Little bluestem (*Andropogon scoparius*)	0.25

Effectiveness: Reclamation and revegetation would be accelerated with decreased erosion and gullying.

2. Mitigation: Implement erosion control measures in the Carlsbad Resource Area (BLM Roswell District) as required by the authorizing officer. One example of such a measure is the use of waterbars with the following guidelines:

o Simulate the imaginary contour lines of the slope, ideally with a grade of 1 percent to 2 percent.

o Drain down and away from the disturbed area.

o Begin and end in vegetation.

o Use the following spacing intervals:

Slope (%)	Interval (ft.)
less than 2.5	200
2.5 to 5	150
6 to 9	100
more than 9	50

Effectiveness: This measure would help minimize soil loss caused by water erosion.

3. Mitigation: In areas of sand dunes in the Carlsbad Resource Area, blade land properly so that the pipeline is not buried within the dunes. Bury the pipeline a minimum of 30 inches below the original surface (before ROW grading and

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[1] Measures 24 and 32 apply only to the Kern River Proposal.

leveling activities) so that subsequent wind action does not expose the pipeline.

Effectiveness: This measure would prevent sand blowouts from exposing the pipeline.

4. Mitigation: In the Carlsbad Resource Area, keep blading to an absolute minimum, with no blading of flat areas, where possible, and no blading of spoil areas. In areas where the spoil side has not been prebladed, keep the blade at least 2 inches above the ground.

   Effectiveness: This measure would help preserve plant root structure and aid in revegetation of disturbed areas.

5. Mitigation: Prior to construction on public lands in the Carlsbad Resource Area, have a qualified biologist survey all potential raptor habitat within 0.25 mile of the pipeline. Identify active and inactive nests. Do not permit construction within 0.25 mile of active aeries during the nesting season (April 1 to October 1 for raptors). Permit construction near inactive nests; do not disturb nests.

   Effectiveness: This measure would prevent nest abandonment resulting from pipeline construction and would provide flexibility for construction scheduling.

6. Mitigation: Prohibit vehicle operation off the ROW by construction workers, including construction work and employee access, except where specified by the landowner or land management agency.

   Effectiveness: Limiting vehicle use off the ROW would minimize the risk of impacting livestock, wildlife habitat, small mammals, reptiles, and important or sensitive vegetation in surrounding habitats.

7. Mitigation: Within the BLM's Carlsbad Resource Area, paint all above-ground facilities sandstone brown and periodically maintain them in accordance with federal standard 595-20318 or 30318.

   Effectiveness: This measure would comply with federal (BLM) standards.

8. Mitigation: The pipeline project should be limited to a 50-foot ROW overlapping existing ROW's MN-070224 and MN-8722 with ditch lines not more than 20 feet off existing ditch lines. If extra construction width is necessary, it will be held to a maximum of 20 feet confined to the southwest side of the ditch line between the compression station and the New Mexico Potash Company tailings and on the northeast side between New Mexico Potash and the tie-off point.

Effectiveness: Limiting the ROW width will reduce vegetative disturbance, reduce soil erosion, and enhance site reclamation.

9. Mitigation: The proposed pipeline should be routed on the northeast side of the existing pipeline from the Transwestern Compressor Station to just before the New Mexico Potash Company, Inc., mine tailings and on the southwest, south of this point. Routing around or through the potash tailings will be determined with appropriate special stipulations at a later date.

   Effectiveness: This routing would be the least environmentally disturbing alternative while only requiring crossing the existing line once.

10. Mitigation: Prior to issuance of grant, the BLM will require confirmation that Transwestern has coordinated with the New Mexico Potash Company, Inc., to ensure that 1) subsidence from potash removal will not impact the proposed pipeline, and 2) that the most feasible route is developed either through or around the potash tailings and settling ponds. Any new routes will be evaluated, archaeologically cleared, etc., prior to authorization.

    Effectiveness: This measure will reduce possible environmental and safety impacts and financial loss from pipeline breakage from subsidence. It will also minimize impacts to the New Mexico Potash Company, Inc., operation.

11. Mitigation: Transwestern must replace any water lines or drinkers damaged as a result of pipeline construction.

    Effectiveness: Existing water facilities are adjacent to or on the current pipeline. This will ensure that the livestock permittee will not suffer damage to his livestock operation.

12. Mitigation: The White River Resource Area recommends an alternative route for the Rangely Loops along the Rangely-Dragon Trail road.

13. Mitigation: Selective salvage of available topsoil, in accordance with guidance available from the Rock Springs District Office, should be used throughout Wyoming.

14. Mitigation: In desert tortoise habitat restriction of construction window between:

    October 15 and March 1 in the western Mojave Desert and northeastern Colorado Desert of California.

    October 1 and April 1 in the eastern Mojave Desert of California (Ivanpah Valley), Nevada and Utah.

October 30 and March 1 in Arizona.

A competent tortoise biologist will survey the proposed route(s) immediately in advance of and during construction and will remove active and/or hibernating tortoises to a site (e.g., a hibernaculum) outside the ROW.

A competent tortoise biologist will return the tortoises to capture points within the ROW after construction and other surface-disturbing activities have been completed.

A competent tortoise biologist will be on-site during any flushing or hydrostatic testing of pipelines.

Injured or dead tortoises will be handled and/or disposed of according to Memorandum of Understanding with state fish and game agencies and the U.S. Fish and Wildlife Service (Utah). Injured tortoises may be rehabilitated and returned to their home sites.

In the western Mojave Desert, where off-road vehicle use is common, barriers and signs will be placed along the ROW to inhibit development and use of the ROW as an off-road vehicle road or trail. This measure is likely to be necessary in other areas, such as the Goodsprings and California Wash crucial habitats in Nevada and near Critical Habitat in Utah.

In the western Mojave Desert, where desert tortoise populations and habitat are in serious condition, and where federal listing of the populations is imminent, land acquisition is necessary. Land acquisition as a mitigation measure will be undertaken in consultation with the BLM, USFWS (Laguna Niguel office), and California Department of Fish and Game. Federal agencies also may recommend land acquisition in other areas.

15. Mitigation: A COM plan should be required.

16. Mitigation: A reclamation plan should be required.

17. Mitigation: Conduct a survey to identify caves within the construction area of Transwestern's Loop A within the karst area northwest of Roswell, New Mexico.

18. Mitigation: Require that water be supplied for antelope pasture isolated during the construction period.

19. Mitigation: A plan for compensation for threatened and endangered species habitat impact should be required.

20. Mitigation: Provide measures to protect wildlife species and habitat during discharge of hydrostatic test water.

21. Mitigation: Monitoring for public safety should be provided during construction through the Stoddard Valley open area.

22. Mitigation: If construction of Transwestern Loop A takes place between March 1 and May 15 measures should be implemented to avoid abandonment of lambs by ewes.

23. Mitigation: The applicant(s) should notify each grazing permittee of the schedule for construction.

24. Mitigation: Reroute Kern River mainline to avoid visual impact to people approaching Rainbow Basin National Landmark on Fossilbed Road north of Barstow, California. It should follow Fort Irwin Road to Fossilbed Road proceeding west on the south side of the road.

25. Mitigation: Archaeological monitoring should be required during surface disturbing activities in the Canyon Pintado Historic District along the Rangely Loop A.

26. Mitigation: Since about 95 percent of all archaeological sites in the Rio Puerco Resource Area are eligible for the National Register of Historic Places, mitigation of the sites, or a sample thereof, under a SHPO approved mitigation plan should be required before beginning construction.

27. Mitigation: Intensive on-the-ground cultural resource surveys must be conducted in all construction areas.

28. Mitigation: On slopes greater than 25 percent, mulch, waterbars spaced every 50 feet, and riprap (where appropriate) should be used.

29. Mitigation: Stream banks should be riprapped.

30. Mitigation: Transwestern Loop D should be routed north and east of the Griego limestone pit in the east half of Section 20 T11N, R9W.

31. Mitigation: Control discharge of hydrostatic test water.

32. Mitigation: In Nevada, sales of Joshua trees, cactus and other plants used for landscaping should be conducted prior to construction. Sales should not be conducted in the summer, with processing of the sale to begin at least three months before construction.

33. Mitigation: Existing roads should be used for access to the maximum extent during all phases of construction.

34. Mitigation: Mowing of the ROW after construction should be forbidden.

35. Mitigation: Pipeline construction will be contained within or adjacent to existing roads where feasible.

36. Mitigation: Fencelines should be braced before cutting the fence.

37. Mitigation: Notify resource users, including holders of mining claims, prior to construction.

38. Mitigation: Where habitat disturbance cannot be mitigated, the applicant should purchase an equitable area of suitable habitat to compensate for habitat lost. If the purchased land is of poorer quality than the habitat lost, then an appropriately larger tract of land must be substituted. Instead of purchasing an equitable tract of habitat, the applicant may deposit an appropriate sum of money in a land bank, if allowed by the state, (e.g., local chapter of the Nature Conservancy) which would then purchase and manage a tract of suitable habitat.

4.10.7.2 U.S.D.A. Forest Service Recommended Mitigation Measures

The right-of-way grant and notices-to-proceed issued by the Bureau of Land Management (BLM) and the Construction, Operation, and Maintenance (COM) Plans issued and developed by the BLM and FS will include general and specific mitigation measures and stipulations. These measures and stipulations for lands administered by the FS will include, but not be limited to, the following:

[The resource(s) addressed by the mitigation measures are listed at the end of each measure.]

1. Technical assistance and approval of written plans for National Forest System lands would be obtained from the FS prior to any construction.

2. Standard procedures for the proposed pipeline project(s) would include implementation of erosion control and revegetation measures to assure that lands disturbed by construction activities would be restored to a stable, productive, and aesthetically acceptable condition. [Soils, Geology, Freshwater and Terrestrial Biology, and Visual Resources]

3. Detailed site-specific geotechnical and restoration and reclamation plans would be developed and become part of the construction,operation, and maintenance (COM) plan. Because the proposed ROW is composed of many types of terrain, soils, water, bedrock, vegetation, land uses, and climatic conditions, the detailed plan would include sets of techniques and measures tailored to each condition

encountered. Local expertise and locally effective slope stabilization and reclamation methods would be followed when the site-specific procedures for the detailed plans are developed. Site-specific geotechnical and erosion control, revegetation, and restoration measures from the plans would be implemented under the direction of the appropriate agency official. [Soils, Geology, Freshwater and Terrestrial Biology]

4. During construction of the project, an on-site reclamation specialist would be employed by the company(s) to provide: a) liaison with FS officials; b) expertise to direct applicable restoration procedures when special conditions are encountered, without causing construction delays; and c) favorable public relations. [Soils, Terrestrial Biology]

5. General erosion control and restoration measures are applicable to the following activities and would be included as part of the COM Plan:

   - o ROW and Site Clearing
   - o Trenching and Preservation of Topsoil
   - o Backfilling and Grading
   - o Land Preparation and Cultivation
   - o Revegetation
   - o Maintenance and Monitoring
   - o Use of Biochemicals

   [Soils, Geology, Freshwater and Terrestrial Biology]

6. Land grading would be done only on the area required for construction. [Soils, Geology]

7. Sidehill cuts would be kept to a minimum to ensure resource protection and a safe and stable plane for efficient equipment use. The FS would provide assistance and would approve sidehill cuts prior to construction. [Soils, Geology, Surface and Ground Water, Vegetation]

8. Existing ground cover such as grasses, leaves, brush, and tree trimmings would be cleared and piled only to the extent necessary. Slash and limbs would be piled and later shredded and chipped for use in restoration operations or disposed of as directed by the FS. [Soils, Vegetation]

9. Trees and shrubs on the ROW that are not cleared would be protected from damage during construction. [Vegetation]

10. Where the ROW crosses streams and other water bodies, the banks would be stabilized to prevent erosion. Construction techniques would minimize damage to shorelines, recreational areas, and fish and wildlife habitat. [Soils,

Surface Water, Freshwater Biology, Wildlife, Recreation Sites/Uses]

11. Care would be taken to avoid oil spills and other types of pollution in all areas including streams and other water bodies and in their immediate drainage areas. All spills would be immediately cleaned up. [Freshwater and Terrestrial Biology]

12. Design and construction of all temporary, reconstructed, and newly constructed roads would be based on an approved COM Plan transportation section and would ensure proper drainage, minimize soil erosion, and preserve topsoil. This plan would include clearing work, rehabilitation, and use and maintenance agreements associated with transportation needs.

    Where possible, the ROW itself would be used as an access road during the construction period. The FS would require that the access roads paralleling this pipeline be closed and vegetative cover reestablished after pipeline construction is completed. No maintenance roads along the pipeline route would be permitted.

    Overland access may be specified in lieu of road construction or reconstruction.

    All temporary roads would be closed and areas restored without undue delay or maintained as specified in the ROW grant(s) or special use permit(s). Restoration to near original slope and contour, including redistribution of topsoil, would be to the satisfaction of the FS. [Soils, Surface Water, Socioeconomics-Traffic/Safety]

13. During adverse weather conditions, as determined by the authorized officer, stop and start orders would be issued to prevent rutting or excessive tracking of soils and deterioration of vegetation in the ROW area. [Soils, Vegetation]

14. During construction activities near streams or lakes, sedimentation (detention) basins and/or straw bale filters would be constructed to prevent suspended sediments from reaching downstream watercourses or lakes, as required by the FS. [Surface Water, Freshwater Biology]

15. Actual construction activities would immediately follow clearing operations, especially in areas of soil that are highly susceptible to wind or water erosion and other special areas. [Soils]

16. All topsoil would be conserved for reclamation requirements, unless otherwise directed by the FS; excess topsoil would be stockpiled at designated locations. Topsoil would

be removed from the trench area by double-ditching (i.e., wind-rowed separately, protected, and replaced last during backfilling). [Soils]

17. In trenching operations, remaining unearthed materials would be removed and stored in a manner that facilitates back-filling procedures, uses a minimum amount of ROW area, and protects the excavated material from vehicular and equipment traffic. [Soils]

18. Coffer dams or other diversionary techniques would be used where necessary to permit flow in one part of a stream while pipe laying construction occurs in another part. [Surface Water]

19. A specific trenching and excavated material stockpiling procedure would be used on steep-sloping and rough, broken terrain to ensure minimum disturbance as outlined in the COM plan. [Soils, Geology, Surface and Ground Water]

20. Trench backfill would be replaced in a sequence and density similar to the preconstruction soil condition. [Soils, Geology, Ground Water]

21. Trench backfilling operations would be conducted in such a manner to minimize further disturbance of vegetation. [Vegetation]

22. The contour of the ground would be restored to permit normal surface drainage. [Soils, Geology, Surface Water]

23. In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces would be constructed to divert water away from the pipeline trench and reduce soil erosion along the ROW and other adjoining areas disturbed during construction. [Soils, Geology, Surface and Ground Water]

24. The surface would be graded to conform to the existing surface of the adjoining areas except for an adequate crown over the trench to compensate for natural subsidence. [Soils]

25. Topsoil would be uniformly replaced over the trench fill and other disturbed areas to restore productivity to its pre-construction condition. [Soils, Vegetation]

26. Materials unsuitable for backfilling or excess backfill material would be disposed of as arranged by the FS. [Soils, Vegetation]

27. Temporary work space areas used at stream and highway crossings and other special sites would be restored to approximate preconstruction conditions and to the

satisfaction of FS. [Surface Water, Freshwater Biology, Socioeconomics-Traffic/Safety]

28. Chiseling would be used, unless objected to by the FS, in range land areas to reduce compaction and improve soil permeability. Pitting and contour furrowing as directed by the FS would be done on steeper slopes of disturbed areas to increase infiltration and to reduce runoff and erosion. [Soils, Surface Water, Grazing]

29. Suitable mulches and other soil stabilizing practices would be used on all regraded and topsoil areas to protect unvegetated soil from wind and water erosion and to improve water absorption. [Soils, Surface Water, Vegetation]

30. Rock mulches would be used in steep-sloping rock outcrop areas and low precipitation areas to reduce erosion and promote vegetal growth. [Soils, Vegetation]

31. Cultivation and land preparation operations on steeply sloping areas would be done on the contour to minimize erosion. [Soils, Vegetation]

32. Soil areas with rock fragments, such as very coarse gravel, cobble, or stone scattered on the surface, would be restored to the original pre-construction surface condition to blend with the adjoining area, to avoid a smooth surface ROW area, and to control accelerated erosion. [Soils, Visual Resources]

33. The revegetation program, methods and procedures would be consistent with local climate and soil conditions and would follow recommendations and directions of local experts. Revegetation efforts would be continued until a satisfactory vegetative cover is established. [Soils, Vegetation]

34. Special mulching practices or matting would be necessary in critical areas, where wind and water are serious erosion hazards, to protect seeding, seedlings after germination, and plantings. [Soils, Vegetation]

35. Commercial fertilizers would be applied to soil areas with low inherent fertility to establish grass seedings. Application rates would be commensurate with annual precipitation and available irrigation water. [Vegetation]

36. Seedbed for areas seeded to grass would be prepared to provide a firm and friable condition suitable for the establishment of grass stands. [Vegetation]

37. A firm seedbed would be prepared prior to seeding. This would include a mulch of plant residues or other suitable

materials. A cover crop may be needed in larger disturbed areas. [Vegetation]

38. Seed would be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method, because it is usually most successful.

- o Drill seeding with a grass drill equipped with depth bands would be used where topography and soil conditions allow operations of equipment to meet the seeding requirements of the species being planted.
- o Broadcast seeding would be used for inaccessible or small areas. Seed would be covered by raking or harrowing.
- o Hydroseeding would be done in critical areas determined by the FS. [Vegetation]

39. Only species adapted to local soil and climatic conditions would be used. Generally, these would be native species. However, introduced species may be considered for specific conditions when approved by the FS. Seeding rates in critical area plantings and generally throughout the ROW would be increased 100 percent over regular seeding rates to allow for seed mortality due to adverse growing conditions. [Vegetation]

40. Seed testing will be conducted to meet state, Federal, and agency seed requirements. [Vegetation]

41. Seeding would be done when seasonal or weather conditions are most favorable, and as determined by the FS. [Vegetation]

42. Grazing would be delayed for a period directed by the FS to provide for vegetation to become established, especially in highly erodible areas. Procedures for excluding grazing within the ROW could involve protective fencing; removable of range animals from affected allotments, with compensation by the company(s) to range permittee; adjustable grazing use schedules within allotments; etc. In the case of protective fencing, fences would be constructed, maintained and removed by the company(s) according to FS specifications. [Vegetation, Grazing]

43. In the areas of low annual precipitation (generally less than 8 to 10 inches), where reseeding is not suitable or as successful, erosion control structures and measures would be applied on sloping areas to: a) reduce accelerated erosion; b) allow reestablishment of preconstruction surface soil conditions; and c) allow natural revegetation. [Soils, Vegetation]

44. Indigenous trees and shrubs would be reestablished in areas as specified in the revegetation section of the COM Plan. As directed by the FS, temporary and/or permanent structures would be installed by the company(s) at specific locations along the ROW and other disturbed sites to prevent off-road vehicle access. [Soils, Vegetation, Recreation Use, Visual Resources]

45. Joint inspection of the ROW by the company(s) and Forest Service would be conducted to monitor the success and maintenance of erosion control measures and revegetation programs on native grazing lands for two growing seasons, or for a period determined by the FS. The monitoring program would identify problem areas and corrective measures to ensure vegetation cover and erosion control. Certification of successful revegetation and erosion control would be determined by the FS. [Soils, Vegetation, Grazing]

46. The applicant(s) would conduct all activities associated with the project in a manner that would avoid or minimize degradation of air, land, and water quality. In the construction, operation, maintenance, and abandonment of the project, the applicant(s) would perform its activities in accordance with applicable air and water quality standards related facility siting standards, and related plans of implementation, including but not limited to, the Clean Air Act, as amended (42 USC 1321). [Air Quality, Geology, Freshwater Biology and Terrestrial Biology]

47. Engine oil changed on National Forest System lands would be contained in suitable containers and disposed as refuse. [Surface Water, Ground Water, Freshwater Biology, Terrestrial Biology]

48. The FS would require adherence to the latest State Oil and Hazardous Spills Plan/Directory. The applicant(s) would develop a hydrocarbon spill prevention , control, and countermeasures plan, following the guidelines established within the corresponding State Plan/Directory. This plan would address a) notification of appropriate agency personnel, b) actions that would be taken to detect and stop spills, c) methods of collection and removal of the spill, and d) follow-up treatment of residual hydrocarbons in the environment. The plan would include state-of-the-art techniques for containment and clean-up of appropriate size classes of discharges included in the governing State's Oil and Hazardous Spills Plan/Directory. The use, design and deployment of the techniques would be specified by water course and land use areas in the plan. Containment, removal, and disposal techniques would require prior approval and authorization of the land management agency. [Surface Water, Ground Water, Freshwater Biology, Terrestrial Biology]

49. When providing access to the pipeline ROW, all rivers, streams, and washes would be crossed at existing roads or bridges unless other crossings were approved and designated by the FS. The applicant(s) would be required to install culverts or bridges at points where new permanent access roads would cross live streams to allow unobstructed fish passage. Where drainages would be crossed by temporary roads, dirt fills or culverts would be placed and removed upon completion of the project. Any construction activity in a perennial stream would be prohibited unless specifically allowed by FS. All stream channels and washes would be returned to their natural state. Such construction, would be managed under the restrictions in the current FS manual and/or Department of Agriculture Policy direction. [Surface Water, Freshwater Biology]

50. Vegetation cleared during construction would be disposed of per FS direction. Where commercial tree species are cut and a current market is available, the trees would be measured and paid for as directed by the FS. [Vegetation, Land Ownership/Use]

51. The applicant(s) would be required to control noxious weeds in areas where the soil surface has been modified or natural vegetation has been removed. Noxious weeds would be controlled in areas designated by FS officials. [Vegetation]

52. Areas would be identified in the COM Plan where access or management constraints preclude standard construction methods. If the terrain or management constraints warrant, the FS would direct the applicant(s) to use helicopters to string pipe, deliver equipment, or perform other phases of construction. [Soils, Geology, Surface WAter, Groundwater]

53. Areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movement would be avoided where practical in locating the linear facilities. Where such avoidance is not practical the design, based upon detailed state-of-the-art geotechnical analysis, would include special measures to minimize (to the satisfaction of the FS) the potential for mass movements. These measures would include, but not be limited to: a) special ditch configurations; b) special construction techniques; c) slope stabilization systems such as dewatering lines, retaining structures, etc.; and d) ground movement sensors. Existing soils and geological data will be gathered and used to achieve acceptable slope stabilization, revegetation, and soil erosion mitigation responses. [Soils, Geology, Surface Water, Groundwater]

54. Clearing in timbered areas to reduce fire hazard for maintenance purposes would be limited to the working space ROW. [Vegetation, Visual Resources]

55. The FS would require preclearing of mountain brush and tree-covered areas prior to dozer or maintenance blade work. Preclearing would involve handwork or specialized equipment, i.e., mechanized shears, etc., in cutting of brush and trees with removal by proper equipment to designated areas. [Soils, Vegetation]

56. The reestablishment of vegetative cover as well as watershed stabilization measures would be scheduled during the ongoing working season and prior to the succeeding winter season. The applicant(s) would follow this schedule as directed by the FS. If the FS allows final cleanup and revegetation to be delayed until the next construction season, the applicant(s) would take temporary measures to achieve short-term stabilization over the winter until final cleanup and revegetation activities could proceed.

Temporary measures would be approved by the FS and could include the following:

- o Constructing temporary breakers at proper intervals on slopes and access roads to control runoff whenever applicable;
- o Installing silt screens as silt barriers in swales, at the base of small slopes, and in other areas subject to sedimentation from low velocity runoff;
- o Temporarily seeding critical areas such as road cuts and stream banks with an approved grass seed mixture;
- o Mulching slopes; and
- o Protecting drains with barriers.

[Soils, Geology, Surface Water, Freshwater Biology, Terrestrial Biology]

57. The FS would direct the applicant(s) to control ORV vehicle use of the ROW. Such specified control could include use of physical barriers, replanting trees, or other reasonable means of vehicle control. [Soils, Surface Water, Vegetation, Visual Resources, Recreation Use]

58. Construction equipment would not be refueled and maintained within stream channels; such activities would be done in areas designated by the FS. [Surface Water, Freshwater Biology, Wildlife]

59. The applicant(s) would comply with applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities and operations. The applicant(s) would obtain approval from

the FS of a plan prior to the use of such substances. The plan would provide the type and quantity of material to be used; the pest, insect, fungus, etc., to be controlled; the methods of application; the location of storage and disposal of containers; and other information that the Forest Supervisor might require. The plan would be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1, 1986, deadline for a fiscal year 1988 action). If the need for emergency use of pesticides is identified, the use would be approved by Forest Supervisors. The use of substances on or near the rights-of-way and temporary permit areas would be in accordance with the approved plan. A pesticide would not be used if the Secretaries of the Interior and Agriculture have prohibited its use. A pesticide would be used only in accordance with its registered uses and with other Secretarial limitations. Pesticides would not be permanently stored on National Forest System lands. [Socioeconomics-Health/Safety]

60. All existing improvements under federal management or permit would be protected and damage would be repaired immediately. [Land Ownership/Use]

61. FS approval would be required for locating sites for equipment storage, pipeline storage, and staging areas on National Forest System lands. A site preparation plan would be required for these sites. The site preparation plan would be part of the COM Plan. [Land Ownership/Use]

62. All structures such as terraces, levees, underground drainage systems, irrigation pipelines, and canals would be restored to preconstruction conditions so that they would function as originally intended. [Land Ownership/Use]

63. Gates on established roads on National Forest System lands would not be locked or closed by the applicant(s). [Land Ownership/Use]

64. Permittee and other regular users of National Forests affected by construction of the project(s) would be notified in advance of any construction activity that might affect their businesses or operations. This would include but not be limited to temporary road closures, removal and/or cutting of fences, disturbances to range improvements or other range use-related structures. [Grazing, Land Ownership/Use]

65. If a natural barrier used for livestock control is broken during construction, the applicant(s) would adequately fence the area to prevent drift of livestock. In pronghorn antelope ranges, the fence might have to be constructed to

allow for antelope passage. Fence specifications would be determined on a case-by-case basis. [Grazing]

66. The applicant(s) would prepare a plan to minimize visual impacts from structures. If required by the FS, the applicant(s) would prepare photographic simulations of areas in which facilities are proposed within foreground/ middle-ground areas of high scenic value or sensitivity. Using the simulation as a guide, the applicant(s) would design and locate the pipeline route and ancillary structures to blend into the existing environment. The FS would evaluate and approve measures before construction begins. [Visual Resources]

67. For the COM Plan, the FS would identify segments of pipeline ROW where vegetative clearing widths would be modified, i.e., feathered or undulated. This would be done to maintain the visual quality objectives of the respective National Forest Land and Resource Management Plan. [Visual Resources]

68. A fire control plan would be prepared by the applicant(s) and this plan would be made a part of the COM Plan. [Safety]

69. Garbage and other refuse would be disposed of in an authorized disposal site or landfill. [Socioeconomics-Health]

70. Pipeline activities may be controlled or restricted on the day before, opening day, and on weekends of the general deer and open elk hunting seasons.

71. Schedule construction activities so as to minimize impacts on high interest species such as big-game animals and raptors during periods of high stress (i.e., migration, breeding, and/or birthing).

72. When technically feasible, powerlines to compressor stations will be buried in areas of low visual absorption and high visual sensitivity to reduce visual impacts.

4.10.7.3 U.S. Fish and Wildlife Service Recommended Mitigation Measures:

1. To avoid impacting Yuma Clapper Rail breeding habitat, the pipeline should cross the Colorado River south of Interstate 40.

2. The Topock Maze, a Native American intaglio, should be avoided during construction and operation.

3. Topsoil should be selectively salvaged and replaced, and areas disturbed during construction revegetated with native grasses and shrubs.

4. Streams should not be dewatered during construction.

5. Streams should be crossed during low-flow periods.

6. Stream channels should be restored to their original bottom contours, substrate composition, gradients, lengths, and alignments.

7. Disturbance of riparian vegetation should be minimized.

8. Duration of instream construction should be minimized.

9. Spillage of grease, oil, and gasoline in streams should be prevented.

10. Disturbed streambanks should be graded, matted, and reseeded with perennial grasses adapted for the area. Riprap should be used where bank erosion is a problem.

11. The natural flow of surface and subsurface water that maintains wetlands should not be impaired.

12. All wetlands should be restored to preconstruction condition.

13. Construction in the Bear River should not occur during April, May, or June.

14. Project related powerlines should be designed to protect birds from electrocution and collision.

15. Raptor surveys and measures for nest protection should be coordinated with the appropriate FWS field office.

16. Use of any pesticides, including herbicides, on national refuge lands would require clearance through the FWS Regional Environmental Containment Coordinator.

17. Wetland and riparian vegetation impacted by construction or operation should be replaced in kind.

18. Public access to the ROW should be discouraged.

19. The proposed pipelines should not cross Havasu National Wildlife Refuge.

4.10.7.4 U.S. Air Force - Edwards Air Force Base Mitigation Measures

1. Measures to control fugitive dust and enhance stabilization and revegetation of disturbed soils are needed.

2. Leak detection and preventative measures should be implemented.

3. Inspection flights through Restricted Airspace R-2508 must be coordinated with the Air Force Flight Test Center (AFFTC).

4. Field surveys for candidate species _Cymopterus_ _deserticola_ and _Chorizanthe_ _spinosa_ should be conducted.

5. Joshua trees should be avoided by the route. Trees that are unavoidable should be removed and transplanted if under five feet in height and, if over five feet in height, knocked down and encouraged to resprout adjacent to the ROW.

6. For AFFTC lands, the pipeline company shall ensure cultural and paleontological survey coverage to federal standards (BLM Class III) for a 1000 foot wide corridor (previously surveyed areas may be omitted). The company will complete all cultural and paleontological work in accordance with AFFTC general and specific stipulations as discussed in _Cultural Resource Impact Mitigation Information and General Stipulations, Edwards AFB, Ca._

4.11 UNAVOIDABLE ADVERSE IMPACTS

4.11.1 _Mojave Proposal_

Implementation of the _applicable_ mitigation measures presented in Sections 4.10 _of Volume I and 3.1 of Volume III_ would reduce the impacts associated with the Mojave proposal and the alternatives. Those significant impacts that would remain following mitigation are presented below in Table 4.11-1. Only those disciplines with significant impacts prior to mitigation are included in Table 4.11-1.

4.11.2 _El Dorado Proposal_

Implementation of the _applicable_ mitigation measures presented in Sections 4.10 _of Volume I and 3.1 of Volume III_ would reduce the impacts associated with the El Dorado proposal and its routing alternatives. Those significant impacts that would remain following mitigation are presented in Table 4.11-2.

Table 4.11-1

SIGNIFICANT ADVERSE IMPACTS FOR THE MOJAVE PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY				
Construction and operation	Slope stability in the Tehachapi Mountains potential landslides	5, 6, 11, and 13	Implementation of appropriate controls would resolve significant impacts	No
	Subsidence: hydrocompaction potential is significant between MP 290-312 and 260-270	10, 14	Reduce potential to cause hydrocompaction to minimal levels	No
	Potential ground rupture at fault crossings including Garlock, White Wolf, and Edison	5, 6, and 13	Ground motion parameters developed will be used in seismic design of the pipeline and ancillary structures	No
SOILS				
Construction and operation	Probability of significant wind erosion is high on the Mojave Transfer Line and on the Main line between MP 0-128.5, 166-176	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, and 38	Probability of successful revegetion will be improved on affected soils	Yes
	Probability for significant water erosion is high on mainline between MP 153-154, 228-256, 312-316	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	Water erosion potential will be decreased and probability of successful revegetation will be improved	Yes
SURFACE WATER				
Construction and operation	Probability of significant intensive surface runoff increasing sediment load and decreasing water quality in the Tehachapi Mountains, Kern River, and Poso Creek	39, 40, 42, 43, 44, 45, 50, 51, 52, 57, and 58	Reclamation potential of some soils on steep slopes may be so poor that stabilization may take 5 to 10 years	No
	Possibility of significant impact caused by hydrostatic test water withdrawal and discharge	48, 49, 53, 54, 55, and 56	Minimize scouring and reduce increased sedimentation to streams, minimize downstream impact on water availability	No
GROUNDWATER				
Construction and operation	Possibility of significant impacts to ground water caused by contamination due to fuel or chemical spills around MP 200	56 and 59	Reduce potential for spills and avoid shallow ground water areas	No
	Possible adverse impact on springs	60	Damage to important springs due to and grading would be minimized	No
FRESHWATER BIOLOGY				
Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed banks stream banks	No

Table 4.11-1 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE MOJAVE PROPOSAL

Discipline	Mitigation 1/ Significant Impact	Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur primarily along the northern end of the Kern River Lateral	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce magnitude of impacts	No
	Loss of oak-pine woodland habitat would occur in the Tehachapi Mountains. Loss of plant species of special concern.	67, 68, 71, 73, 82, 84, and 85	Realignment of the proposed route to avoid populations or habitats of plant species would be most effective method of reducing impacts	No
	Loss of wildlife species of special concern including threatened or endangered species and associated habitats	86, 90, 91, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, and 115	Reduce stress on animals and destruction of habitat associated with use of ORV's, identification of construction periods to coincidence with wildlife requirements would reduce stress, habitat identification could be possible mitigation to reduce impacts	Yes
	Loss of individual desert tortoise and their habitat	89, 96, 97, 110, 111, and 113	Reduce impacts to individuals and habitats	No
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflicts	130, 145, 146, and 147	Reduce impacts to individuals and and reduce land use/ownership conflicts	Yes
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed	133 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds and reduction of significant fossiliferous formations. This would result in a permanent loss of the resource.	139	Reduce impacts by monitoring would allow some knowledge on the formation which would allow assessment of the formation for future research	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of established VRM class could occur.	140, 141, and 142	Reduce impacts to the visual environment to acceptable levels by following contours, revegetating, etc.	No

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1/ Numbers refer to mitigation measures listed in Section 4.

Table 4.11-2

SIGNIFICANT ADVERSE IMPACTS FOR THE EL DORADO ALTERNATIVE

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY				
Construction and operation	Slope stability in the Tehachapi Mountains, potential landslides	7, 8, 9, 13, 14, and 12	Implementation of appropriate controls would resolve significant impacts	No
	Subsidence: hydrocompaction potential is significant between MP 290-310 and 256-268	13 and 14	Reduce potential to cause hydrocompaction to minimal levels	No
	Potential ground rupture at fault crossings including Garlock, White Wolf, and Edison	13	Ground motion parameters developed will be used in seismic design of the pipeline and ancillary structures	No
SOILS				
Construction and operation	Probability of significant wind erosion is high on the North Receipt Lateral and on the Main line between MPO-180	16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, and 38	Probability of successful revegetion will be improved on affected soils	Yes
	Probability for significant water erosion is high on mainline between MP 146-147, 240-254, 305-310	16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	Water erosion potential will be decreased and probability of successful revegetation will be improved	Yes
SURFACE WATER				
Construction and operation	Probability of significant intensive surface runoff increasing sediment load and decreasing water quality in the Tehachapi Mountains, Kern River, and Poso Creek	41, 42, 43, 50, 51, 52, 57, and 58	Reclamation potential of some soils on steep slopes may be so poor that stabilization may take 5 to 10 years	No
	Possibility of significant impact caused by hydrostatic test water withdrawal and discharge	48, 49, 53, 54, 55, and 56	Minimize scouring and reduce increased sedimentation to streams, minimize downstream impact on water availability	No
GROUNDWATER				
Construction and operation	Possibility of significant impacts to ground water caused by contamination due to fuel or chemical spills	56 and 59	Reduce potential for spills and avoid shallow ground water areas	No
	Possible adverse impact on springs	60	Damage to important springs due blasting and grading would be minimized	No
FRESHWATER BIOLOGY				
Construction and operation	Increased turbidity and sedimentation of aquatic habitat	61, 62, 63, 64, and 65	Reduce instream disturbance and restore disturbed stream banks	No

Table 4.11-2 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE EL DORADO ALTERNATIVE

Discipline	Mitigation 1/ Significant Impact	Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur primarily along the northern end of the East Delivery Lateral	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce magnitude of impacts	No
	Loss of oak-pine woodland habitat would occur in the Tehachapi Mountains. Loss of plant species of special concern.	67, 68, 71, 73, 82, 84, and 85	Realignment of the proposed route to avoid populations or habitats of plant species would be most effective method of reducing impacts	No
	Loss of wildlife species of special concern including threatened or endangered species and associated habitats	86, 91, 92, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 111, 112, 113, 114, and 115	Reduce stress on animals and destruction of habitat associated with use of ORV's, identification of construction periods to coincidence with wildlife requirements would reduce stress, habitat identification could be possible mitigation to reduce impacts	Yes
	Loss of individual desert tortoise and their habitat	92, 96, 97, 110, 111, and 113	Reduce impacts to individuals and habitats	No
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflicts	130 and 153	Reduce impacts to individuals and reduce land use/ownership conflicts	Yes
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed	134 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds and reduction of significant fossiliferous formations. This would result in a permanent loss of the resource.	139	Reduce impacts by monitoring. Would allow some knowledge on the formation which would allow assessment of the formation for future research	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of established VRM class could occur.	140, 141, and 142	Reduce impacts to the visual environment to acceptable levels by following contours, revegetating, etc.	No

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1/ Numbers refer to mitigation measures listed in Section 4.

4.11.3 El Paso Proposal

Implementation of the applicable mitigation measures presented in Sections 4.10 of Volume I and 3.1 of Volume III would reduce the impacts associated with the El Paso proposal and its alternative. Those significant impacts that would remain following mitigation are presented in Table 4.11-3. Only those disciplines with significant impacts prior to mitigation are included in the table.

4.11.4 Northwest Expansion Project

Implementation of the applicable mitigation measures presented in Sections 4.10 of Volume I and 3.1 of Volume III would reduce the impacts associated with the Northwest Expansion. Those significant impacts that would remain following mitigation are presented in Table 4.11-4.

4.11.5 Transwestern Proposal

Implementation of the applicable mitigation measures presented in Sections 4.10 of Volume I and 3.1 of Volume III would reduce the impacts associated with the Transwestern Proposal. Those significant impacts that would remain following mitigation are presented in Table 4.11-5. Only those disciplines with significant impacts prior to mitigation are included in the table.

4.11.6 Integrated Intrastate System Alternative

Implementation of mitigation measures presented for the Mojave proposal in Section 4.10.1 would reduce the impacts associated with the ~~Danby--compressor--station~~ equivalent of the Mojave Transfer Line along the Integrated Intrastate System line. Unavoidable adverse impacts would occur to soils, ~~terrestrial biology-and-wildlife~~ if the ~~station~~ transfer line is located on its current site.

4.12 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

4.12.1 Mojave Proposal

Short term is defined as the construction period of the Mojave project plus one year for ROW rehabilitation. Long term is defined as the remaining life of the project through abandonment and reclamation; this would be approximately 40 years. Following completion of project construction and rehabilitation of the ROWs no significant decreases in the productivity of the project area are expected.

Table 4.11-3

SIGNIFICANT ADVERSE IMPACTS FOR THE EL PASO PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Possibility of significant slope instability along the Window Rock, Leupp and Williams Loops (Base Case and Alternatives)	13 and 14	Implementation of appropriate controls would resolve significant impact	No
SOILS Construction and operation	Reclamation potential would be poor on nearly one-half of total construction mileage (Base Case and Alternatives)	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would substantially increase	Yes
TERRESTRIAL BIOLOGY Construction and operation	Loss of approximately 0.8 acres of wetland and riparian vegetation would occur along portions of the loops (Alternatives)	67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts	No
	Loss of individuals and habitat of plant species of special concern would potentially occur along 7 of the loops (Base Case and Alternatives)	67, 68, 69, 70, 71, 84, and 85	Realignment would effectively reduce impacts by avoiding populations of sensitive species and their habitats	No
	Impacts of the Ferruginous and Swainson's hawk, Mountain plover, desert tortoise and gila monster (all species of special concern) and their habitat could potentially occur along a number of loops Ferruginous and Swainson's hawk, and Mountain Plover (Base Case and Alternative); Desert Tortoise and Gila monster (Alternatives only)	86, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, and 115	Reduction of stress on sensitive species during critical time periods would minimize overall impacts on the population, as would restricting access	No
LAND USE/OWNERSHIP Construction and operation	Land use/ownership conflict (Alternative)	129, 130, 131, 132, and 157	Eliminate crossing the Elden Environmental Study Area	No

Table 4.11-3 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE EL PASO PROPOSAL

Discipline	Mitigation 1/ Significant Impact	Measures	Effectiveness	Residual Significant Impact
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and the research potential which could be permanently destroyed (Base Case and Alternatives)	135 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials Base Case and Alternative)	138 and 158	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds, localities or formations could result in a permanent loss of the resource (Base Case and Alternative)	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES Construction and operation	Loss of significant visual environment and degradation of VRM or VQO class could occur (Alternatives)	140, 141, and 142	Reduction of visual impacts to acceptable level is possible	No

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1/ Numbers refer to mitigation measures listed in Section 4.

Table 4.11-4

SIGNIFICANT ADVERSE IMPACTS FOR THE NORTHWEST EXPANSION PROJECT

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Rangely A & B Loops are in areas with significant slope stability problems	13 and 14	Implementation of appropriate controls could resolve significant impact	No
	Rangely A & B Loops are in areas with significant potential to be impacted by flooding and debris flows	14	Reduce damage potential from flooding and debris flows	No
SOILS Construction and operation	The potential for significant water erosion is high on some portions of the Cisco Loop. Reclamation potential would be poor on the Muddy Creek, Cisco and Moab Loops	16, 18, 19, 21, 24, 25, 26, 27, 28, 28, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would be considerably increased	Yes
SURFACE WATER Construction and operation	High potential for increase in sediment loading to Douglas Creek along Rangely Loop A and to East Salt Creek along Rangely Loop B	42, 43, 50, 51, 52, 57, and 58	Measures would reduce the amounts of sediment available for entry into the streams and restrict its transport	No
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed stream beds	No
TERRESTRIAL BIOLOGY Construction and operation	Loss of over 5 acres of wetland and riparian vegetation would occur along portions of the Muddy Creek, Rangely A, Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts.	No
	Potential loss of plant species of special concern (threatened or endangered) could occur along portions of the Rangely B, Cisco, Moab and Cahone Loops	67, 68, 71, 84, 85, and 160	Impacts would be reduced if sensitive species or habitats could be avoided. Limiting access would minimize additional disturbance.	No
	Loss of wildlife species of special concern and associated habitats could occur along all the loops	86, 96, 97, 98, 99 100, 101, 103, 104, 105, 106, 107, 109, 111, 112, 113, 114, and 115	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No

Table 4.11-4 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE NORTHWEST EXPANSION PROJECT

Discipline	Mitigation [1] Significant Impact	Measures	Effectiveness	Residual Significant Impact
TERRESTRIAL BIOLOGY (continued)				
	Disturbance of golden eagle, prairie falcon and burrowing owl nesting sites along the loops could be significant	86, 98, 99, 103, 104, 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of an active sage grouse lek along the Muddy Creek Loop is significant	96, 99, 100, 101, 103, 104 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of pronghorn or critical winter range is significant along the Muddy Creek Loop	96, 99, 100, 101, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Potential for black-footed ferret along the Muddy Creek, Green River, Cisco, Moab and Cahone Loops exists	99, 100, 101, 103, 104, 105, 112, 113, 114, 161, and 162	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
	Disturbance of an active peregrine falcon aeyrie near the Moab Loop would be significant	86, 98, 99, 103, 104, 105, 112, 113, and 114	Stress on sensitive species during critical periods would be reduced and impacts minimized. Restricting access would also reduce stress.	No
LAND USE	Significant impacts to existing ROW users could occur along Rangely Loop A	129, 130, 131, and 132	Consultation with appropriate ROW users should resolve any conflicts	No
CULTURAL RESOURCES Construction and operation	Potential loss of significant cultural resources and research potential which could be permanently destroyed	137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials	138	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES Construction and operation	Potential loss of significant fossil finds, localities or formations could result in a permanent loss of the resource	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES Construction and operation	Loss of visual environment and degradation of VRM or VQO class could occur	140, 141, and 142	Reduction of visual impacts to acceptable levels is possible	No

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[1] Numbers refer to mitigation measures listed in Section 4.

Table 4.11-5

SIGNIFICANT ADVERSE IMPACTS FOR THE TRANSWESTERN EXPANSION PROPOSAL

Discipline	Significant Impact	Mitigation 1/ Measures	Effectiveness	Residual Significant Impact
GEOLOGY Construction and operation	Potential of significant slope instability along portions of some of the loops	6, 7, 13, and 14	Implementation of appropriate controls would resolve significant impact	No
	Probability of significant impacts caused by subsidence along Loops A and E	10 and 14	Reduce hydrocompaction potential to minimal levels	No
	Potential ground rupture at fault crossing in western Rio Grande Rift Valley	5, 6, and 13	Ground motion parameters would be developed and used in seismic design of the pipeline	No
SOILS Construction and operation	Reclamation potential would be poor on one-half of total construction mileage	16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38	The probability of successful reclamation would be substantially increased	Yes
FRESHWATER BIOLOGY Construction and operation	Increased turbidity and sedimentation of aquatic habitat	63, 64, and 65	Reduce instream disturbance and restore disturbed stream beds	No
TERRESTRIAL BIOLOGY Construction and operation	Loss of wetland and riparian vegetation would occur along portions of some of the loops	66, 67, 68, 71, 83, 84, and 85	Successful implementation would greatly reduce the magnitude and duration of impacts	No
	Loss of sensitive plant species habitat could occur along portions of the loops	67, 68, 71, 84, and 85	Successful implementation would would effectively reduce impacts by avoiding populations of sensitive species	No
	Loss of endangered and threatened wildlife species and habitat could occur on portions of some of the loops	86, 87, 93, 94, 95, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, 115, 167, 168, and 169	Reduction of stress on sensitive species during critical time periods would minimize overall impacts on the population, as would restricting access	No

Table 4.11-5 (continued)

SIGNIFICANT ADVERSE IMPACTS FOR THE TRANSWESTERN EXPANSION PROPOSAL

Discipline	Mitigation 1/ Significant Impact	Measures	Effectiveness	Residual Significant Impact
LAND USE/OWNERSHIP				
Construction and operation	Land use/ownerhip conflict	129, 130, 131, 132, 170, 171, and 172	Would eliminate all conflicts	No
CULTURAL RESOURCES				
Construction and operation	Potential loss of significant cultural resource data could occur causing a loss of scientific knowledge	136 and 137	Gain as much non-redundant information and follow guidelines for research established in the technical report	No
	Impacts to American Indian concerns such as sacred areas and burials	138 and 173	Information from American Indians should resolve these problems	No
PALEONTOLOGICAL RESOURCES				
Construction and operation	Potential loss of significant fossil finds, localities or formations would result in a permanent loss of the resource	139	Reduction of impacts by monitoring would provide some knowledge on the formations allowing future research in adjacent areas	No
VISUAL RESOURCES				
Construction and operation	Loss of visual environment and degradation of VRM or VQO class could occur	140, 141, and 142	Reduction of visual impacts to acceptable level is possible	No

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1/ Numbers refer to mitigation measures listed in Section 4.

Many of the significant impacts associated with the Mojave project would be short term and would cease to be significant following ROW rehabilitation. A summary of short- and long-term impacts is presented in the Short-Term and Long-Term Impacts Tables (Table 4.12-1).

4.12.2 El Dorado Proposal

See Section 4.12.1 for definitions of short- and long-term impacts.

Many of the significant impacts associated with the El Dorado project would be short-term. A summary of short- and long-term impacts is presented in Table 4.12-2.

4.12.3 El Paso Proposal

See Section 4.12.1 for definitions of short- and long-term impacts.

A summary of short- and long-term impacts is presented in Table 4.12-3 for El Paso.

4.12.4 Northwest Expansion Project

See Section 4.12.1 for definitions of short- and long-term impacts.

A summary of short- and long-term impacts is presented in Table 4.12-4 for Northwest.

4.12.4 Transwestern Proposal

See Section 4.12.1 for definitions of short- and long-term impacts.

A summary of short- and long-term impacts is presented in Table 4.12-5.

4.13 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

4.13.1 Mojave Proposal

Construction and operation of the Mojave Proposal and all alternatives could result in either the irreversible or irretrievable commitment of certain resources. An irreversible commitment of a resource is one which cannot be changed once it occurs; an irretrievable commitment means that the resource

Table 4.12-1

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE MOJAVE PIPELINE PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality	The project would not significantly deteriorate existing air quality in the project area on the long-term, but would cause a short-term impact during the construction phases.
Geology	No significant short-term or long-term impacts are anticipated.
Soils	During construction there would be short-term losses of soil due to erosion; no long-term impacts are anticipated.
Surface Water	There would be short-term impacts to surface water during construction; no significant long-term impacts are anticipated.
Groundwater	No significant short-term or long-term impacts are anticipated.
Freshwater Biology	No significant short-term or long-term impacts are anticipated.
Vegetation	All vegetation types crossed by the pipeline would suffer short-term impacts. Oak woodlands and desert scrubland would not regenerate within the life of the project (40 years) and would suffer long-term impacts.
Wildlife	Losses to desert tortoises and other species of special concern as well as general wildlife species impacted would suffer short-term decreases in local populations. Long-term productivity would not be impaired.
Grazing	Destruction of forage would be a temporary impact that could change grazing patterns or alter management system for one to three grazing seasons.
Socioeconomics	In the short-term, construction of the project would provide provide employment for 1,918 workers and result in increased

Table 4.12-1 (continued)

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE MOJAVE PIPELINE PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Socioeconomics (continued)	spending in local areas. In the long-term, operations would employ 47 workers and increased property tax revenues would be realized by the counties crossed by the pipeline.
Traffic	There would be no short-term or long-term impacts to transportation.
Noise	Short-term impacts would occur to nearby residences during pipeline construction. There would be no significant long-term impacts.
Recreation	Short-term disruptions of recreation activities would occur. No significant long-term impacts would occur.
Land Use	Short-term disruptions of agriculture would occur. Long-term impacts to orchards and and vineyards would occur. Short-term and possibly long-term impacts to residences within 50' of the pipeline would occur.
Cultural Resources	Disturbance or destruction of cultural resources could result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Paleontology	Disturbance or destruction of paleontological resources would result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Visual Resources	Short-term impacts to visual resources would occur during construction of the pipeline and compressor station. Some impacts would remain for the life of the project.
System Safety	A major pipeline break could potentially occur during pipeline operation. Effects to sensitive resources could last from a few days to several years.

Table 4.12-2

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE EL DORADO PIPELINE ALTERNATIVE

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality	The project would not significantly deteriorate existing air quality in the project area on the long-term, but would cause a short-term impact during the construction phases.
Geology	No significant short-term or long-term impacts are anticipated.
Soils	During construction there would be short-term losses of soil due to erosion; no long-term impacts are anticipated.
Surface Water	There would be short-term impacts to surface water during construction; no significant long-term impacts are anticipated.
Groundwater	No significant short-term or long-term impacts are anticipated.
Freshwater Biology	No significant short-term or long-term impacts are anticipated.
Vegetation	All vegetation types crossed by the pipeline would suffer short-term impacts. Oak woodlands and desert scrubland would not regenerate within the life of the project (40 years) and would suffer long-term impacts.
Wildlife	Losses to desert tortoises and other species of special concern as well as general wildlife species impacted would suffer short-term decreases in local populations. Long-term productivity would not be impaired.
Grazing	Destruction of forage would be a temporary impact that could change grazing patterns or alter management system for one to three grazing seasons.
Socioeconomics	In the short-term, construction of the project would provide provide employment for 1,918 workers and result in increased

Table 4.12-2 (continued)

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE EL DORADO PIPELINE PROPOSAL

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Socioeconomics (continued)	spending in local areas. In the long-term, operations would employ 47 workers and increased property tax revenues would be realized by the counties crossed by the pipeline.
Traffic	There would be no short-term or long-term impacts to transportation.
Noise	Short-term impacts would occur to nearby residences during pipeline construction. There would be no significant long-term impacts.
Recreation	Short-term disruptions of recreation activities would occur. No significant long-term impacts would occur.
Land Use	Short-term disruptions of agriculture would occur. Long-term impacts to orchards and and vineyards would occur. Short-term and possibly long-term impacts to residences within 50' of the pipeline would occur.
Cultural Resources	Disturbance or destruction of cultural resources could result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Paleontology	Disturbance or destruction of paleontological resources would result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Visual Resources	Short-term impacts to visual resources would occur during construction of the pipeline. Some impacts would remain for the life of the project.
System Safety	A major pipeline break could potentially occur during pipeline operation. Effects to sensitive resources could last from a few days to several years.

Table 4.12-3

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE EL PASO EXPANSION PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality **Base Case and Alternative**	The project would not significantly deteriorate existing air quality in the project area on the long-term but would cause short-term impacts during construction.
Geology **Base Case and Alternative**	No significant short-term or long-term impacts are anticipated
Soils **Base Case and Alternatives**	During construction there would be short-term losses of soil due to erosion; no long-term impacts are anticipated.
Surface Water **Alternatives**	There would be short-term impacts to surface water during construction; no significant long-term impacts are anticipated.
Groundwater **Base Case and Alternatives**	No significant short-term or long-term impacts are anticipated.
Freshwater Biology **Base Case and Alternatives**	No significant short-term or long-term impacts are anticipated.
Vegetation **Base Case and Alternatives**	All vegetation types crossed by the pipeline would suffer short-term impacts. Forest areas and desert scrubland would not regenerate within the life of the project (40 years) and would suffer long-term impacts.
Wildlife **Base Case and Alternatives**	Losses to desert tortoises **(Alternatives only)** and other species of special concern as well as general wildlife species impacted would suffer short-term decreases in local populations. Long-term productivity would not be impaired.
Grazing **Base Case and Alternatives**	Destruction of forage would be a temporary impact that could change grazing patterns or alter management system for one to three grazing seasons.

Table 4.12-3 (continued)

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE EL PASO EXPANSION PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Socioeconomics **Base Case and Alternatives**	In the short-term, construction of the project would provide provide employment for 1,066 workers **(Alternatives)** and result in increased spending in local areas. In the long-term, operations would employ no new workers and increased property tax revenues would be realized by the counties crossed by the pipeline.
Traffic **Base Case and Alternatives**	There would be no short-term or long-term impacts to transportation.
Noise **Base Case and Alternatives**	Short-term impacts would occur to nearby residences during pipeline construction. There would be no significant long-term impacts.
Recreation **Alternatives**	Short-term disruptions of recreation activities would occur. No significant long-term impacts would occur.
Land Use **Alternatives**	Short-term disruptions of agriculture would occur. ~~Long-term impacts to orchards and vineyards would occur.~~ Short-term and possibly long-term impacts to residences within 50' of the pipeline would occur.
Cultural Resources **Base Case and Alternatives**	Disturbance or destruction of cultural resources could result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Paleontology **Base Case and Alternatives**	Disturbance or destruction of paleontological resources would result in the loss of some scientific understanding which would be both a short-term and long-term impact.
Visual Resources **Alternatives**	Short-term impacts to visual resources would occur during construction of the pipeline. ~~and compressor station.~~ Some impacts would remain for the life of the project.
System Safety **Base Case and Alternatives**	A major pipeline break could potentially occur during pipeline operation. Effects to sensitive resources could last from a few days to several years.

Table 4.12-4

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE NORTHWEST EXPANSION PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality	The project would not significantly deteriorate existing air quality in the project area on the long-term but would cause short-term impacts during the construction phases
Geology	Significant short-term and long-term impacts could occur along portions of the Rangely Loops.
Soils	During construction there would be short-term losses of soil due to erosion; no long-term impacts are anticipated.
Surface Water	There would be short-term impacts to surface water during construction; no significant long-term impacts are anticipated.
Groundwater	No significant short-term or long-term impacts are anticipated.
Freshwater Biology	No significant short-term or long-term impacts are anticipated.
Vegetation	All vegetation types crossed by the pipeline would suffer short-term impacts. Forest and riparian zone vegetation would not regenerate within the life of the project (40 years) and would suffer long-term impacts.
Wildlife	Losses to species of special concern as well as general wildlife species impacted would suffer short-term decreases in local populations. Long-term productivity would not be impaired.
Grazing	Destruction of forage would be a temporary impact that could change grazing patterns or alter management system for one to three grazing seasons.

Table 4.12-4 (continued)
SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE NORTHWEST EXPANSION PROJECT

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Socioeconomics	In the short-term, construction of the project would provide provide employment for 1,755 workers and result in increased spending in local areas. In the long-term, operations would employ no new workers and increased property tax revenues would be realized by the counties crossed by the pipeline.
Traffic	There would be no short-term or long-term impacts to transportation.
Noise	Short-term impacts would occur to nearby residences during pipeline construction. There would be no significant long-term impacts.
Recreation	Short-term disruptions of recreation activities would occur. No significant long-term impacts would occur.
Land Use	Short-term disruptions of agriculture would occur. No long-term impacts would occur. Short-term and possibly long-term impacts to residences within 50' of the pipeline would occur.
Cultural Resources	Disturbance or destruction of cultural resources could result in the loss of some scientific understanding which would be both short-term and long-term impacts.
Paleontology	Disturbance or destruction of paleontological resources would result in the loss of some scientific understanding which would be both short-term and long-term impacts.
Visual Resources	Short-term impacts to visual resources would occur during construction of the pipeline and compressor station. Some impacts would remain for the life of the project.
System Safety	A major pipeline break could potentially occur during pipeline operation. Effects to sensitive resources could last from a few days to several years.

Table 4.12-5

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE TRANSWESTERN EXPANSION PROPOSAL

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality	The project would not significantly deteriorate existing air quality in the project area on the long-term but would cause short-term impacts during the construction phases.
Geology	No significant short-term or long-term impacts are anticipated.
Soils	During construction there would be short-term losses of soil due to erosion; no long-term impacts are anticipated.
Surface Water	There would be short-term impacts to surface water during construction; no significant long-term impacts are anticipated.
Groundwater	No significant short-term or long-term impacts are anticipated.
Freshwater Biology	No significant short-term or long-term impacts are anticipated.
Vegetation	All vegetation types crossed by the pipeline would suffer short-term impacts. Forested areass and desert scrubland would not regenerate within the life of the project (40 years) and would suffer long-term impacts.
Wildlife	Losses to desert tortoises and species of special concern as well as general wildlife species impacted would suffer short-term decreases in local populations. Long-term productivity would not be impaired.
Grazing	Destruction of forage would be a temporary impact that could change grazing patterns or alter management system for one to three grazing seasons.
Socioeconomics	In the short-term, construction of the project would provide provide employment for 2,173 workers and result in increased

Table 4.12-5 (continued)

SHORT-TERM AND LONG-TERM IMPACTS RESULTING FROM THE TRANSWESTERN EXPANSION PROPOSAL

Resource	Relationship of Short-Term Use of Environment and Long-Term Productivity
Socioeconomics (continued)	spending in local areas. In the long-term, operations would employ no new workers and increased property tax revenues would be realized by the counties crossed by the pipeline.
Traffic	There would be no short-term or long-term impacts to transportation.
Noise	Short-term impacts would occur to nearby residences during pipeline construction. There would be no significant long-term impacts.
Recreation	Short-term disruptions of recreation activities would occur. No significant long-term impacts would occur.
Land Use	Short-term disruptions of agriculture would occur. No long-term impacts would occur. Short-term and possibly long-term impacts to residences within 50' of the pipeline would occur.
Cultural Resources	Disturbance or destruction of cultural resources could result in the loss of some scientific understanding which would be both short-term and long-term impact.
Paleontology	Disturbance or destruction of paleontological resources would result in the loss of some scientific understanding which would be both short-term and long-term impact.
Visual Resources	Short-term impacts to visual resources would occur during construction of the pipeline and compressor station. Some impacts would remain for the life of the project.
System Safety	A major pipeline break could potentially occur during pipeline operation. Effects to sensitive resources could last from a few days to several years.

cannot be recovered or reused. Irreversible and irretrievable impacts are summarized in Table 4.13-1. No resources will be overcommitted by the construction or operation of the project.

4.13.2 El Dorado Proposal

Section 4.13-1 defines irreversible and irretrievable commitment of resources. Irreversible and irretrievable impacts are summarized in Table 4.13-2. No resources will be overcommitted by the construction or operation of the project.

4.13.3 El Paso Proposal

Section 4.13.1 defines irreversible and irretrievable commitment of resources. Irreversible and irretrievable impacts are summarized in Table 4.13-3. No resources will be overcommitted by the construction or operation of the project.

4.13.4 Northwest Expansion Project

Section 4.13.1 defines irreversible and irretrievable commitment of resources. Irreversible and irretrievable impacts are summarized in Table 4.13-4. No resources will be overcommitted by the construction or operation of the project.

4.13.5 Transwestern Proposal

Section 4.13.1 defines irreversible and irretrievable commitment of resources. Irreversible and irretrievable impacts are summarized in Table 4.13-5. No resources will be overcommitted by the construction or operation of the project.

4.14 GROWTH INDUCING IMPACTS

4.14.1 Mojave Proposal

As a result of project implementation, an increased supply of natural gas would be made available to the Kern County area. Assuming favorable economic conditions (increased oil prices), this could lead to an acceleration of the shift to natural gas combustion in Thermally Enhanced Oil Recovery (TEOR) steam generation and cogeneration plants. Since natural gas combustion would result in decreased NO_x emissions, there is a potential for a net air quality benefit. The photochemical modeling results show that reduced emissions in NO_x, hydrocarbon emissions and ozone levels would occur. The maximum benefits were predicted to occur in southeast Kern County. However, since the ozone peaks predicted with these reduced emissions would still be above the

Table 4.13-1

COMMITMENT OF RESOURCES RESULTING FROM THE MOJAVE PROPOSAL

Resource	Irreversible	Irretrievable	Comment
AIR QUALITY	no	no	No significant long-term commitment of resources
GEOLOGY	no	no	No significant long-term commitment of resources
SOILS	no	yes	Soil losses caused by both water and wind erosion would be irretrievable
SURFACE WATER	no	no	No significant long-term commitment of resources
GROUNDWATER	no	no	No significant long-term commitment of resources
FRESHWATER BIOLOGY	no	no	No significant long-term commitment of resources
VEGETATION	no	yes	The losses of oak woodlands and desert scrubland would be irretrievable. Oak woodlands and desert scrubland would not regenerate within the life of the project (40 years). Riparian habitat might not recover to former state. These could be considered long-term commitments of resources.
WILDLIFE	no	yes	Losses to desert tortoise and other species of special concern as well as general wildlife species would be irretrievable. This could be considered long-term commitments of resources.
GRAZING	no	no	No significant long-term commitment of resources
SOCIOECONOMICS	no	no	No significant long-term commitment of resources

Table 4.13-1 (continued)

COMMITMENT OF RESOURCES RESULTING FROM THE MOJAVE PROPOSAL

Resource	Irreversible	Irretrievable	Comment
TRAFFIC	no	no	No significant long-term commitment of resources
NOISE	no	no	No significant long-term commitment of resources
LAND USE	no	yes	Commitment of agricultural land would occur for the life of the project. These losses would be irretrievable.
CULTURAL RESOURCES	yes	yes	Disturbances or destruction of cultural resources would be both an irreversible and irretrievable commitment of resources.
PALEONTOLOGICAL RESOURCES	yes	yes	Disturbances or destruction of paleontological resources would be both irreversible and irretrievable commitment of resources.
VISUAL RESOURCES	no	yes	Some impacts to visual resources would remain for the life of the project. This would be an irretrievable commitment of resources.
SYSTEM SAFETY	yes	yes	Major irreversible and/or irretrievable commitment of resources could occur to vegetation, wildlife, and land use if a major pipeline rupture were to occur.

Table 4.13-2

COMMITMENT OF RESOURCES RESULTING FROM THE EL DORADO ALTERNATIVE

Resource	Irreversible	Irretrievable	Comment
AIR QUALITY	no	no	No significant long-term commitment of resources
GEOLOGY	no	no	No significant long-term commitment of resources
SOILS	no	yes	Soil losses caused by both water and wind erosion would be irretrievable
SURFACE WATER	no	no	No significant long-term commitment of resources
GROUNDWATER	no	no	No significant long-term commitment of resources
FRESHWATER BIOLOGY	no	no	No significant long-term commitment of resources
VEGETATION recover to	no	yes	The losses of oak woodlands and desert scrubland would be irretrievable. Oak woodlands and desert scrubland would not regenerate within the life of the project (40 years). Riparian habitat might not former state. These could be considered long-term commitments of resources.
WILDLIFE	no	yes	Losses to desert tortoise and other species of special concern as well as general wildlife species would be irretrievable. This could be considered long-term commitments of resources.
GRAZING	no	no	No significant long-term commitment of resources
SOCIOECONOMICS	no	no	No significant long-term commitment of resources

Table 4.13-2 (continued)

COMMITMENT OF RESOURCES RESULTING FROM THE EL DORADO ALTERNATIVE

Resource	Irreversible	Irretrievable	Comment
TRAFFIC	no	no	No significant long-term commitment of resources
NOISE	no	no	No significant long-term commitment of resources
LAND USE	no	yes	Commitment of agricultural land would occur for the life of the project. These losses would be irretrievable.
CULTURAL RESOURCES	yes	yes	Disturbances or destruction of cultural resources would be both an irreversible and irretrievable commitment of resources.
PALEONTOLOGICAL RESOURCES	yes	yes	Disturbances or destruction of paleontological resources would be both irreversible and irretrievable commitment of resources.
VISUAL RESOURCES	no	yes	Some impacts to visual resources would remain for the life of the project. This would be an irretrievable commitment of resources.
SYSTEM SAFETY	yes	yes	Major irreversible and/or irretrievable commitment of resources could occur to vegetation, wildlife, and land use if a major pipeline rupture were to occur.

Table 4.13-3

COMMITMENT OF RESOURCES RESULTING FROM THE EL PASO EXPANSION PROPOSAL

Resource	Irreversible	Irretrievable	Comment
AIR QUALITY	no	no	No significant long-term commitment of resources
GEOLOGY	no	no	No significant long-term commitment of resources
SOILS	no	yes (Base/Alternative)	Soil losses caused by both water and wind erosion would be irretrievable
SURFACE WATER	no	no	No significant long-term commitment of resources
GROUNDWATER	no	no	No significant long-term commitment of resources
FRESHWATER BIOLOGY	no	no	No significant long-term commitment of resources
VEGETATION	no	yes (Alternative)	The losses of forest areas and desert scrubland would be irretrievable. Forest areas and desert scrubland would not regenerate within the life of the project (40 years). These could be considered long-term commitments of resources.
WILDLIFE	no	yes (Alternative)	Losses to desert tortoise and other species of special concern as well as general wildlife species would be irretrievable. This could be considered long-term commitments of resources.
GRAZING	no	yes (Alternative)	Destruction of forage would change grazing patterns or alter management systems for one to three grazing seasons. This would be an irretrievable commitment of resources.
SOCIOECONOMICS	no	no	No significant long-term commitment of resources

Table 4.13-3 (continued)

COMMITMENT OF RESOURCES RESULTING FROM THE EL PASO EXPANSION PROPOSAL

Resource	Irreversible	Irretrievable	Comment
TRAFFIC	no	no	No significant long-term commitment of resources
NOISE	no	no	No significant long-term commitment of resources
RECREATION	no	yes (Alternative)	Impacts to recreation would result in an irretriev- commitment of resources.
LAND USE	no	yes (Alternative)	Commitment of agricultural land would occur for the life of the project. These losses would be irretrievable.
CULTURAL RESOURCES	yes	yes (Base/Alternative)	Disturbances or destruction of cultural resources would be both an irreversible and irretrievable commitment of resources.
PALEONTOLOGICAL RESOURCES	yes	yes (Base/Alternative)	Disturbances or destruction of paleontological resources would be both irreversible and irretrievable commitment of resources.
VISUAL RESOURCES	no	yes (Alternative)	Some impacts to visual resources would remain for the life of the project. This would be an irretrievable commitment of resources.
SYSTEM SAFETY	yes	yes (Base/Alternative)	Major irreversible and/or irretrievable commitment of resources could occur to vegetation, wildlife, and land use if a major pipeline rupture were to occur.

Table 4.13-4

COMMITMENT OF RESOURCES RESULTING FROM THE NORTHWEST EXPANSION PROJECT

Resource	Irreversible	Irretrievable	Comment
AIR QUALITY	no	no	No significant long-term commitment of resources
GEOLOGY	no	no	No significant long-term commitment of resources
SOILS	no	yes	Soil losses caused by both water and wind erosion would be irretrievable
SURFACE WATER	no	no	No significant long-term commitment of resources
GROUNDWATER	no	no	No significant long-term commitment of resources
FRESHWATER BIOLOGY	no	no	No significant long-term commitment of resources
VEGETATION	no	yes	The losses of forest areas and riparian zone vegetation would be irretrievable. Forest areas and riparian vegetation would not regenerate within the life of the project (40 years). These would be considered long-term commitments of resources.
WILDLIFE	no	yes	Losses to species of special concern as well as general wildlife species would be irretrievable. These would be considered long-term commitments of resources.
GRAZING	no	yes	Destruction of forage would change grazing patterns or alter management systems for one to three grazing seasons. This would be an irretrievable commitment of resources.
SOCIOECONOMICS	no	no	No significant long-term commitment of resources

Table 4.13-4 (continued)

COMMITMENT OF RESOURCES RESULTING FROM THE NORTHWEST EXPANSION PROJECT

Resource	Irreversible	Irretrievable	Comment
TRAFFIC	no	no	No significant long-term commitment of resources
NOISE	no	no	No significant long-term commitment of resources
RECREATION	no	yes	Impacts to recreation would result in an irretriev-commitment of resources.
LAND USE	no	yes	Commitment of agricultural land would occur for the life of the project. These losses would be irretrievable.
CULTURAL RESOURCES	yes	yes	Disturbances or destruction of cultural resources would be both an irreversible and irretrievable commitment of resources.
PALEONTOLOGICAL RESOURCES	yes	yes	Disturbances or destruction of paleontological resources would be both irreversible and irretrievable commitment of resources.
VISUAL RESOURCES	no	yes	Some impacts to visual resources would remain for the life of the project. This would be an irretrievable commitment of resources.
SYSTEM SAFETY	yes	yes	Major irreversible and/or irretrievable commitment of resources could occur to vegetation, wildlife, and land use if a major pipeline rupture were to occur.

Table 4.13-5

COMMITMENT OF RESOURCES RESULTING FROM THE TRANSWESTERN EXPANSION PROPOSAL

Resource	Irreversible	Irretrievable	Comment
AIR QUALITY	no	no	No significant long-term commitment of resources
GEOLOGY	no	no	No significant long-term commitment of resources
SOILS	no	yes	Soil losses caused by both water and wind erosion would be irretrievable
SURFACE WATER	no	no	No significant long-term commitment of resources
GROUNDWATER	no	no	No significant long-term commitment of resources
FRESHWATER BIOLOGY	no	no	No significant long-term commitment of resources
VEGETATION	no	yes	The losses of forest areas and desert scrubland would be irretrievable. Forest areas and desert scrubland would not regenerate within the life of the project (40 years). These could be considered long-term commitments of resources.
WILDLIFE	no	yes	Losses to desert tortoise and other species of special concern as well as general wildlife species would be irretrievable. This could be considered long-term commitments of resources.
GRAZING	no	yes	Destruction of forage would change grazing patterns or alter management systems for one to three grazing seasons. This would be an irretrievable commitment of resources.
SOCIOECONOMICS	no	no	No significant long-term commitment of resources

Table 4.13-5 (continued)

COMMITMENT OF RESOURCES RESULTING FROM THE TRANSWESTERN EXPANSION PROPOSAL

Resource	Irreversible	Irretrievable	Comment
TRAFFIC	no	no	No significant long-term commitment of resources
NOISE	no	no	No significant long-term commitment of resources
RECREATION	no	yes	Impacts to recreation would result in an irretriev- commitment of resources.
LAND USE	no	yes	Commitment of agricultural land would occur for the life of the project. These losses would be irretrievable.
CULTURAL RESOURCES	yes	yes	Disturbances or destruction of cultural resources would be both an irreversible and irretrievable commitment of resources.
PALEONTOLOGICAL RESOURCES	yes	yes	Disturbances or destruction of paleontological resources would be both irreversible and irretrievable commitment of resources.
VISUAL RESOURCES	no	yes	Some impacts to visual resources would remain for the life of the project. This would be an irretrievable commitment of resources.
SYSTEM SAFETY	yes	yes	Major irreversible and/or irretrievable commitment of resources could occur to vegetation, wildlife, and land use if a major pipeline rupture were to occur.

federal standard, additional emission control measures for nitrogen oxides and hydrocarbon would be necessary to attain the standard.

4.14.2 El Dorado Alternative

The El Dorado Proposal would have similar growth inducing impacts as those discussed for Mojave. See Section 4.14.1.

4.14.3 Integrated Intrastate System Alternative

This and any other alternative providing increased supplies of natural gas would have similar growth inducing impacts as those discussed above in Section 4.14.1.

5.0 CEQA ALTERNATIVES

This section provides an analysis of the potential impacts associated with alternatives to the proposed project that were not addressed in Section 4. Although the alternatives discussed here may be feasible, limited design information is available on which to base the impact assessment. The analyses here therefore cannot be carried to the level of detail employed to evaluate the major alternatives discussed in Section 4. If one of the following alternatives is selected by decision makers, it is probable that a supplemental environmental analysis will be required after development of a specific project design.

5.1 ALTERNATIVE SOURCES OF NATURAL GAS

This section describes alternative methods for partial or complete use of locally available gas supplies.

Alternative gas supplies in both Santa Barbara and Kern Counties could be utilized if these supplies are not already used to full capacity. If southern California gas supplies were not being used to full capacity it may be possible for SoCal, PG&E and/or PGT to supply additional gas to the EOR market.

Based on discussions in Section 2 with regard to the intrastate systems, it is unlikely that this alternative would be feasible. If the gas supplies were not utilized to full capacity, California gas suppliers would be required to build natural gas pipelines and delivery laterals similar to those discussed in Section 2.

5.2 ALTERNATIVE METHODS FOR ENHANCED OIL RECOVERY

Alternative methods for enhanced oil recovery have been utilized by the oil industry in various portions of the country. Two methods of EOR could be potentially used which have not been previously discussed: water flooding of the formations and injection of carbon dioxide.

The water flooding method has been successfully used in oil fields throughout the country. While this method has been effective for some types of oil resources, the oil fields in the Kern County area would not be amenable to these methods since the viscosity of the oil would prevent movement of the oil to the well heads.

The carbon dioxide injection method has also been successfully employed in the New Mexico and west Texas oil fields, but again the viscosity of the oil in the Kern County fields would preclude the usage of CO2 injection.

5.3 ALTERNATIVE FUELS FOR ENHANCED OIL RECOVERY

Utilizing current technology no alternative fuels other than oil, natural gas or electricity would be feasible for generating steam for the EOR fields. At some point in the future, alternative fuel supplies such as solar power may be possible. The current state of solar technology, however, is not capable of generating sufficient supplies to meet even the current needs of the EOR market.

If at some point in the future solar powered generators were capable of producing steam in the quantities necessary, the net benefits in air quality and environmental impacts would be quite substantial. Since solar power would cause no air pollution, a great improvement in the air quality in the region would result. Construction of solar generating plants of the size necessary would cause substantially fewer impacts to the environment than those associated with construction of the interstate pipeline discussed in Section 4.

5.4 ALTERNATIVE PIPELINE ROUTES

A wide variety of alternative pipeline routes were described in Section 2. Short of constructing a totally new route no new alternative routings would be feasible.

5.5 ALTERNATIVE AIR POLLUTION CONTROLS

The steam generation plants currently operating in the Kern County area are burning crude oil to generate steam for injection into the oil fields. These plants are not currently using the best available control technology with regard to air pollution equipment. Converting the steam generation plants to the state-of-the-art air pollution control systems would be one way to lower pollution levels. While conversion to new air pollution control systems would be feasible, the costs would be prohibitive. Even installing new pollution control systems would not reduce pollution levels below the levels expected by converting the steam generator plants to natural gas power.

5.2 ALTERNATIVE FUELS FOR ENHANCED OIL RECOVERY

[illegible] technologies to alternative fuels other than oil, natural gas or electricity would be feasible for generating steam for the EOR fields. At some point in the future, alternative fuel sources such as solar power may be possible. The current state of solar technology, however, is not capable of generating sufficient supplies to meet even the current needs of the EOR market.

If at some point in the future solar powered generators were capable of generating steam in the quantities necessary, the net benefit to air quality and environmental impacts would be quite substantial. Since solar power would cause no air pollution, a great improvement in the air quality in the region would result. Construction of solar generating plants of the size necessary would have substantially [illegible] impacts to the environment than those associated with construction of the interstate pipeline discussed in Section 4.

5.3 ALTERNATIVE PIPELINE ROUTES

A wide variety of alternative pipeline routes were described in Section 4. Short of constructing a totally new route no new alternative routings would be feasible.

5.4 RETROFITTING AND POLLUTION CONTROLS

The steam generation plants currently operating in the Kern County area are burning crude oil to generate steam for injection into the oil fields. These plants are not currently using the best available control technology with regard to air pollution equipment. Retrofitting the steam generation plants to the state-of-the-art air pollution control systems would be one way to lower pollution levels. While conversion to new air pollution control systems would be feasible, the costs would be prohibitive. Even installing new pollution control systems would not reduce pollution levels below the levels expected by converting the steam generator plants to natural gas power.